MAR Oncology & Hematology (2023) 6:4

Research Article

Ultrasound Guided FNAC / Biopsy of Small Liver Lesions: Its Importance and Difficulties Encountered in the Field of Oncology

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Received: 30 October 2023

Published: 20 November 2023

Abstract

Introduction: *Liver is a common site of primary and secondary malignant tumors, secondary involvement / metastasis being more common. There are small liver lesions which may not demonstrate typical morphology and are sometimes difficult to characterize. Definitive diagnosis of these small liver lesions is important which aids in better patient management and avoids un-necessary follow up. Here ultrasound guided FNAC/biopsy plays an important role to obtain tissue for cytological/histopathological diagnosis.*

Objective: *Primary objective is to describe the importance of ultrasound guided FNAC/biopsy of small liver lesions and various difficulties encountered.*

Also, based on the author's experience, some technical difficulties in the procedure and how to deal with them, are also described in this paper.

Methods: *The study is a single institution based retrospective analysis of data of cancer patients with small liver lesions whose ultrasound guided FNAC/biopsy were done. Data was obtained from the institutional database. Ultrasound guided FNAC was done using a 9.8cms 25G spinal needle/15cms 23G Chiba needle and biopsy was done using 18G BARD coaxial biopsy gun. Local anesthesia was given at the puncture site. Final cytology/biopsy reports were obtained.*

Results: *Total 28 nodules in 26 patients were targeted. Out of these 28 nodules, FNAC was performed from 26 nodules and biopsy was performed from 2 nodules. Liver lesion sizes range from 5 mm to 20 mm, with mean size of 12.88 mm and median size of 13 mm. Of thesenodules, 24 (85.71%) out of 28 nodules turned out to be metastatic. 4 nodules were benign out of which one was bile duct adenoma, 2 were regenerative nodules and 1 nodule showed reactive atypia.*

Conclusion: *Ultrasound guided FNAC / biopsy of the small liver lesion has an important role in the field of oncology. It helps in obtaining the tissue for cytology / histopathology and thus helps in better management of cancer patients.*

Keywords: *Liver, metastasis, FNAC, biopsy, too small to characterize (TSTC).*

Introduction

Liver is a common site of primary and secondary malignant tumors, secondary involvement / metastasis being more common. The most common site of primary malignancy metastasizing to the liver being carcinoma breast, lung and colon. (1)(2) In oncology, in diagnostic / staging as well as surveillance CT scan of patients, small liver lesions are frequently found. These lesions may not show typical morphology to characterize them into either benign or malignant categories and FNAC/biopsy is sometimes difficult in inexperienced hands. In patients with known malignancy, definite characterization of these lesions into benign vs malignant is crucial in determining the prognosis and treatment. Jones et al (3) reported in their study that liver lesions less than or equal to 15 mm were found in 17% of the cases and were benign in 51% of the 82% of patients with known malignancy. Schwartz et al(4) in their study reported that hepatic lesions less than or equal to 1 cm, deemed too small to characterize, are most often benign, but approximately 11.6 % of these lesions were malignant. Schwartz et al also reported in their study that when these too small to characterize liver lesions were followed, the average reported time for increase in size of these TSTC liver lesions was 13 months if malignant in etiology.

Colin et al(5) reported that almost all of the malignant liver lesions were diagnosed within four weeks, but required long term follow up and un-necessary increased imaging for benign lesion. In patients with liver cirrhosis or focal fatty lesions, it was difficult to differentiate between regenerative nodules or focal fatty lesions from hepatocellular carcinoma (HCC) and such lesions required longer follow up (range of follow up was 2 – 42 weeks). More likely diagnosis in cirrhotic liver is HCC, followed by the high and low grade dysplastic nodules. In cirrhotic liver, liver nodules less than 1 cms require follow up with ultrasound every 3 months while nodules between 1 to 2 cms size require histopathological correlation if imaging findings are atypical. (6)

Stacey et al(7) in their study found that upto 30% of liver lesions, deemed too small to characterize on CT scan, remained indeterminate on MRI. However, follow up imaging and histopathology diagnosis (in few) showed no significant interval change/resolved and benign nature of these lesions respectively. However, when followed up, mean follow up was 60.6 weeks. Unnecessary follow for small lesions increases patient's anxiety and more repeated imaging studies were performed for benign than malignant lesions. White paper of the ACR on management of incidental liver lesion describes that most of the liver lesions less than 1 cms are benign; however suggests follow up MRI after 3 – 6 months in high risk patients for further characterization of these lesions. They also suggest hepatic MRI for liver lesions between 1 – 1.5 cms with

suspicious features on imaging. (8)

However, when patient has known extra-hepatic malignancy, it becomes important to characterize these small liver lesions into benign and malignancy, especially when imaging findings are atypical. Sometimes it becomes difficult to differentiate new onset small liver lesion into benign or malignant, if malignant then labeled as disease progression. Timely intervention of liver metastasis in selected patients has favorable prognosis and delay in diagnosis has poorer prognosis and reduced survival.(9)(10)(11)(12)(13) When solitary or few, as seen often in colorectal cancer where metastatectomy/RFA/intraarterial chemotherapy can be performed(14)(15), to characterize these TSTC liver lesions into benign and malignant, tissue diagnosis is important. Also resection of isolated liver metastasis in carcinoma breast which can be the site of isolated recurrence (16) tissue diagnosis prior to surgery is important.

So if these lesions are intervened early with USG guided FNAC / biopsy which is cost effective, reliable and easily available, early diagnosis is possible with early treatment and this long follow up without appropriate treatment can be avoided.

Therefore, when the suspicion of liver metastasis is high, even when the lesion is small, it is essential to sample it and to get a final cytological / histopathological diagnosis that will aid in precise patient management and in turn improve the outcome.

Materials and Methods

This is a single institution retrospective study performed at National Cancer Institute, Nagpur, Maharashtra, India. Retrospective data was collected of patients who have undergone FNAC / biopsy of small liver lesions during 01.01.2019 to 31.10.2021. Data was collected from the radiology dataset of patients available at the institute. During this period, total 1455 USG guided FNAC and biopsies were performed, out of which 899 were FNACs and 556 were biopsies. Of these, total 53 procedures were performed on liver nodules including 34 FNAC and 19 biopsies, out of which 28 nodules in 26 patients met out study criteria, i.e., liver lesion size less than or equal to 20 mm. Out of these 28 nodules, FNAC was performed on 26 nodules and biopsy on 2 nodules.

Ultrasound guided percutaneous aspirations were done in 26 nodules. For FNAC, 25 G spinal needles were used and for deep lesions in segment VII/VIII which were beyond the reach of the spinal needle that is 9.8 cm long, 23G 15 cm chiba needle was used to obtain tissue. Slides prepared from the aspirate and

transferred to the coplin jar containing 95% ethyl alcohol solution. Few dry smears were also prepared.

Biopsy was done using an 18 G BARD coaxial biopsy needle and 17 G BARD biopsy gun. Multiple cores, at least 4 cores in 4 different positions of the cutting edge, were obtained. Also more cores were obtained by changing the needle position if required.

Samples were sent to the pathology department for further cytological / histopathological reporting.

Technique:

Prior to FNAC/biopsy, liver lesion is evaluated with ultrasound, approach decided and point of entry is marked on skin. FNAC / biopsy can be done using either intercostal, subcostal or transabdominal / sub-xiphoid approach depending upon the location of the liver lesion. (Fig. 1) Then entry site and surrounding area is cleaned with alcohol / betadine. Transducer and wire is covered with sterile probe cover with jelly inside over the transducer, which is important to avoid soiling of the probe and to maintain proper aseptic technique. Local anesthesia with 2% lignocaine is given at the site of entry involving skin and underlying soft tissue along the proposed needle trajectory. Then under ultrasound guidance, a FNAC / biopsy needle is inserted into the lesion avoiding the vessels. Keep the tract of the needle tangential to the ultrasound beam, with this entire tract of the needle can be visualized and, vessels can be avoided using color doppler technique. It is always preferred to put the needle parallel to the vessels and not perpendicular to it, to avoid transection of vessels while taking cores with a gun. (Fig. 2, 3 and 4) We prefer to do the procedures during normal breathing and the needle can be advanced in whichever phase of respiration the lesion is more conspicuous. However, for smaller lesions, those located beneath the rib and deeply seated lesion in segment VII/VIII, breathhold (either during inspiration / expiration) is required. (Fig. 5) While doing FNAC, move the needle to & fro and let the sample collect in the needle with the capillary action and check for the same bylooking at the needle hub. If the sample does not collect in the needle, then gentle suction with a syringe isgiven. Care should be taken not to give excessive negative pressure in the syringe to prevent hemorrhagic aspirate. Generally it requires 2-3 passes for FNAC. Slides are prepared from the aspirate and transferred to the coplin jar containing 95% ethyl alcohol solution. It is better to perform the procedure under the presence of cytologists who can check for the adequacy of the sample obtained and avoiding inconclusive FNAC and repeat procedures. For biopsy, after confirming the position of the needle in the lesion (preferably at the periphery in larger lesion), semiautomatic biopsy gun is inserted and cores are taken. At least 4 cores in 4 different directions of the curing edge are taken and transferred to the container containing formalin.

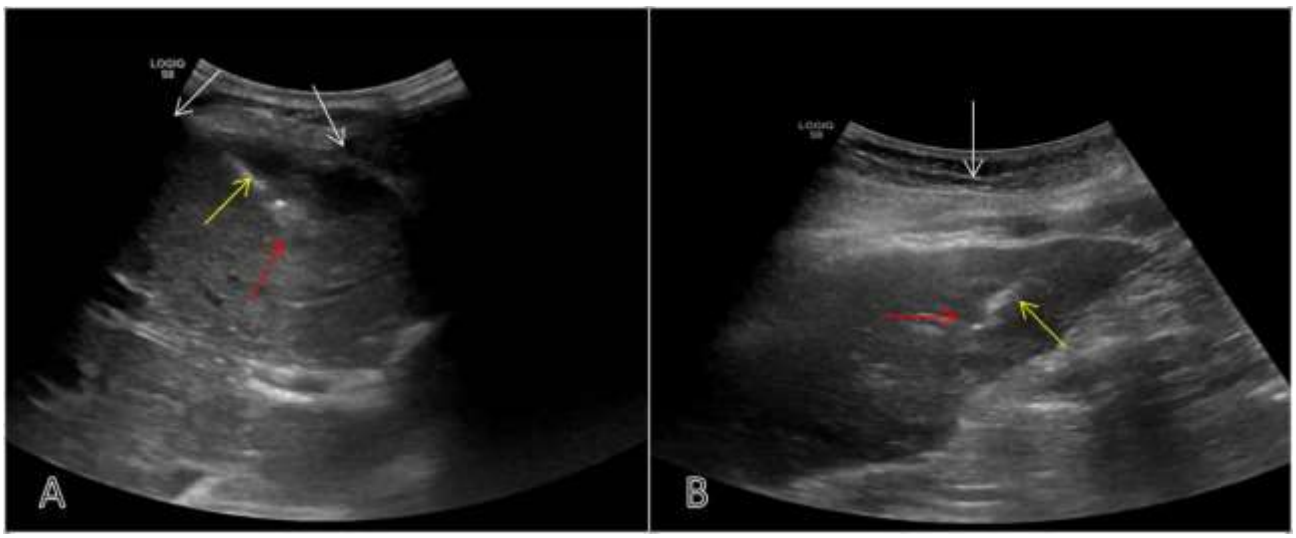

Figure 01: (A) Intercostal Approach – USG guided FNAC of segment IV liver lesion (red arrow). White arrow denoted ribs and yellow arrow FNAC needle. (B) Transabdominal / Sub-xiphoid Approach – USG guided biopsy of segment III liver lesion (red lesion). White arrow denoted anterior abdominal wall and yellow arrow biopsy needle.

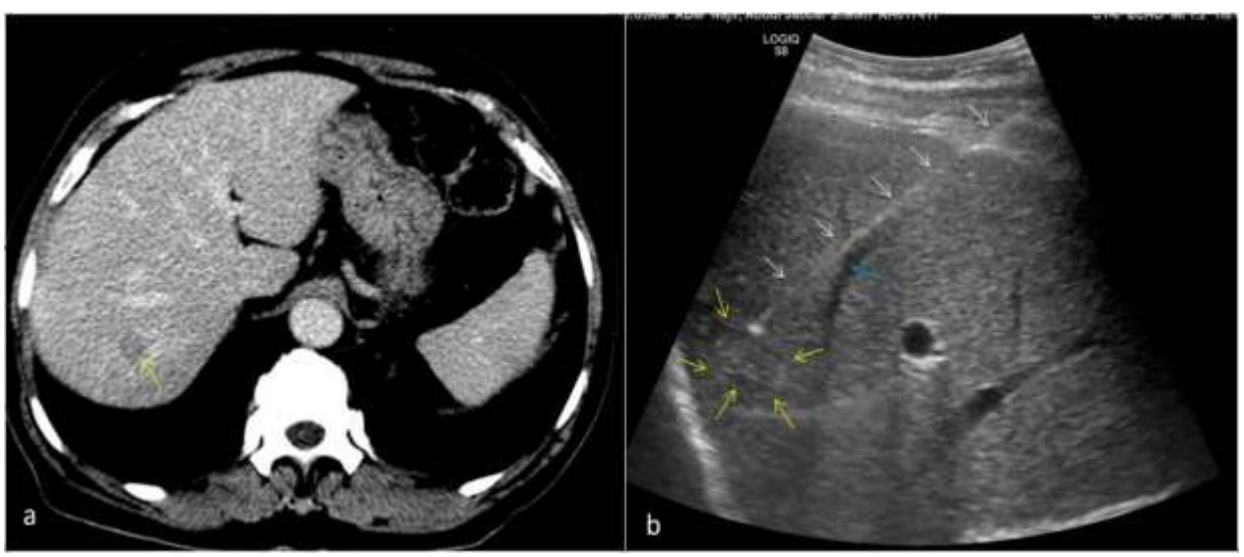

Figure 02: In this treated case of carcinoma rectum, surveillance CT scan reveals a 13 mm nodule in segment VII of liver (yellow arrow in a). USG guided FNAC was performed from this small liver lesion (as shown in b, yellow arrows). Entire course of the 15 cms 23G chiba needle (white arrows) is seen when the needle is parallel to the transducer. Tip of the needle is seen in mildly hyperechoic liver lesion in segment VIII (yellow arrows). Blue arrow shows hepatic vein. Cytology report suggestive of metastasis**.**

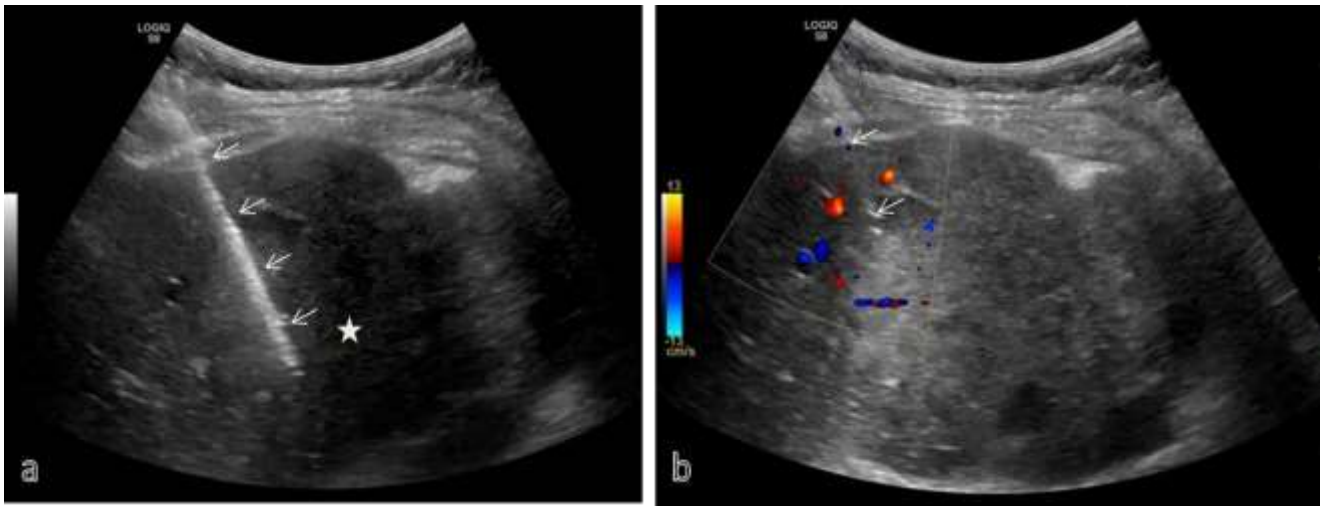

Figure 03: USG guided biopsy has been performed from the right lobe liver lesion in this suspected case of carcinoma gall bladder with liver metastasis. Almost entire needle (arrows) is seen in a with its tip in liver lesion (asterisk). Color doppler image shows vessels (in red and blue colors) on either sides of needle (arrow) which is carefully inserted avoiding the vessels.

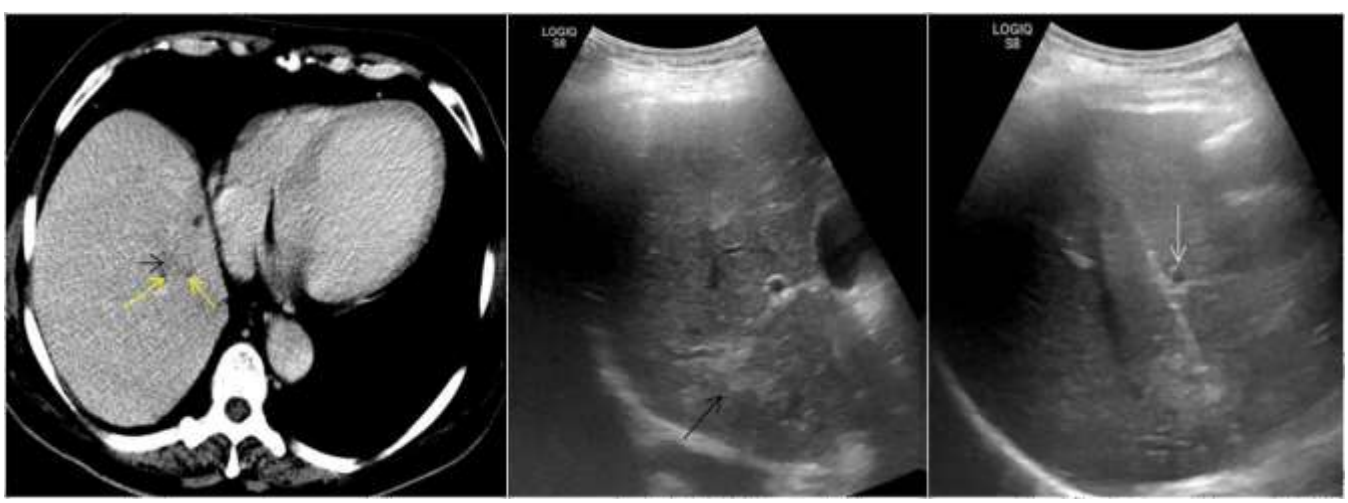

Figure 04: 69 Y / Male, operated case of carcinoma colon, on observation. Surveillance CT scan shows anirregular hypodense lesion in right lobe of liver (black arrow in a) and associated focal IHBR dilatation (yellow arrow in a). Correlative ultrasound shows an irregular hyperechoic lesion in right lobe of liver (black arrow in b). USG guided FNAC was done (c) with needle close to the branch of portal vein (white arrow in c) and is avoided.

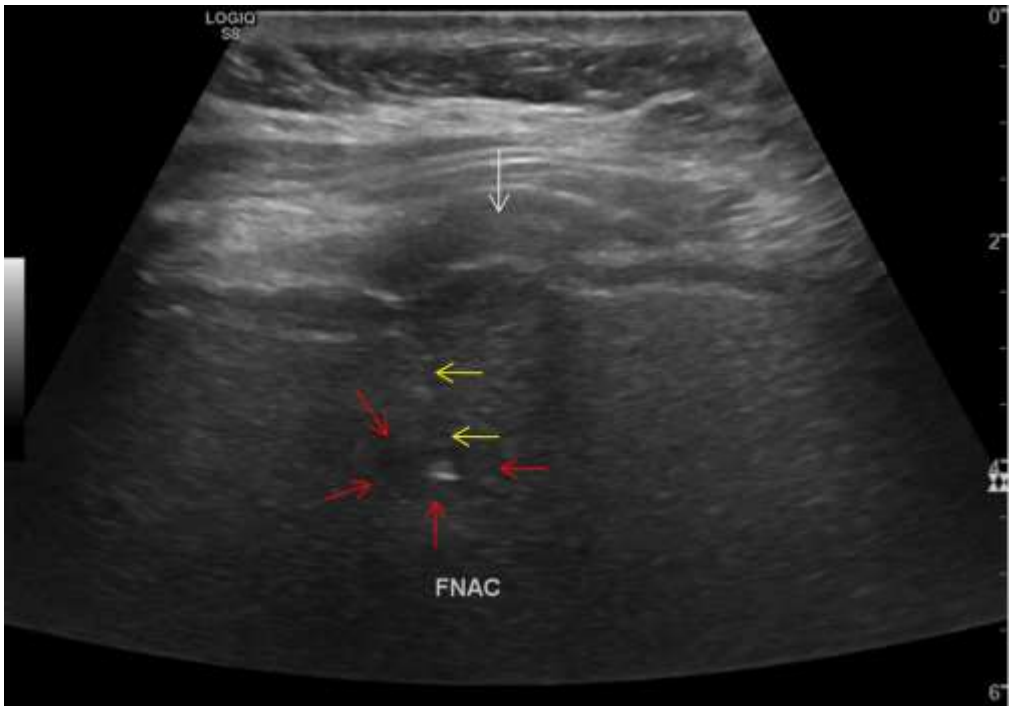

Figure 05: 42Y/Female, known case of carcinoma breast with new onset 5 mm lesion in segment VIII of liver. Note the location of the lesion beneath the rib. Needle was inserted in this small lesion in breathhold during inspiration. White arrow denotes rib, red arrows denote the liver lesion and yellow arrow denotes the spinal needle with its tip inside the liver lesion. Background liver shows fatty infiltration. Cytology report suggestive of reactive atypia in the liver lesion.

Primary & Secondary Outcome

Primary outcome is to describe the importance of ultrasound guided FNAC/biopsy of small liver lesions.

Secondary outcome is to address technical difficulties in the FNAC / biopsy of small liver lesions and methods to deal with them.

Inclusion & Exclusion Criteria

Inclusion Criteria:

1. Patient with known malignancy with small liver lesions of size less than 20 mm
2. Biopsy / FNAC was performed at our institution and histopathology / cytology report available.

Exclusion Criteria:

1. Patient with known malignancy with liver lesions of size more than 20 mm

Statistical Analysis

In this research paper, the collected data has been methodically categorized into distinct groups, allowing for a comprehensive and systematic analysis of the research subject. The subsequent presentation includes a detailed breakdown of data distribution, expressed in terms of percentages. This quantitative approach not only elucidates the prevalence of each category but also uncovers significant trends and patterns within the dataset, thereby enhancing the overall depth and clarity of the findings.

Ethics

The study was approved by the Ethics Committee, National Cancer Institute, Nagpur, Maharashtra, India, on dated 13.08.2021 Approval number is NCI/EC/2018/017/08//2021. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Results

Patient demographic are given in table 1. There are a total 28 nodules in 26 patients, out of which biopsy was done on 2 nodules and FNAC was done on 26 nodules. Out of 26 patients, 11 were male patients and 15 female, with 8 cases of carcinoma breast (30.76%), 7 cases of colo-rectal cancer (26.92%) 3 cases of lung cancer (11.54%), 1 carcinoma buccal mucosa (3.84%), 1 carcinoma cricopharynx (3.84%), 1 case of carcinoma soft palate (3.84%), 1 carcinoma esophagus (3.84%), 1 carcinoma pancreas (3.84%), 1 case of carcinoma urinary bladder (3.84%) and 1 carcinoma cervix (3.84%). 1 patient (3.84%) was being evaluated for liver SOL. (Table 2) Liver lesion sizes range from 5 mm to 20 mm, with mean size of 12.68 mm and median size of 12.5 mm. 1 out of 28 lesions was located in segment II (3.57%), 11 in segment III (39.28%), 3 in segment IVA (10.71%), 2 in segment IVB (7.14%), 3 in segment V (10.71%), 1 in segment VI (3.57%),

3 in segment VII (10.71%) and 4 in segment VIII (14.28%). (Table 3) Of these nodules, radiologically 25 (89.28%) nodules appeared metastatic, 1 (3.57%) nodule regenerative while 2 nodules (7.14%) were suspicious for metastasis as were new onset on follow up imaging and were small (5 mm in size). Out of the 26 patients, 8 (30.77%) patients had single liver lesion, 6 (23.07%) patients had 2 liver lesions, 3 (11.53%) patients has 3 liver lesions, 1 (3.85%) patients had 4 liver lesions, 1 (3.85%) had 5 liver lesions and 7 (26.92%) patients had more than 5 liver lesions. (Table 4) Median number of passes for FNAC was 2. Aspirate from 22 nodules was cellular (84.61 %) while aspirate from 4 lesions was sparsely cellular (15.38%). Two of the 4 sparsely cellular smear were metastatic, 1 nodule showed reactive atypia while 1 showed necrotic aspirate which on repeat FNAC turned out to be metastatic. Biopsy samples obtained for histopathology were adequate for histopathological examination and for immunohistochemistry. On cytology report, 1 (3.84%) nodule was bile duct adenoma, 22 (84.61%) nodules were metastatic, 1 (3.84%) nodule showed reactive atypia and 2 (7.69%) nodules were regenerative nodules. Two nodules, which were biopsied, turned out to be metastatic. In total, 24 (85.71%) out of 28 nodules turned out to be metastatic. In the nodules, which turned out to be regenerative nodules, background liver showed fatty changes in one case and cirrhotic changes in another case. Size of the nodule which showed reactive atypia was 5 mm and the liver showed grade III fatty changes. None of the patients had complications related to the procedure. We have reported accuracy of USG guided FNAC of small liver lesions to be 100%.

Sr. No.	Age	Sex	Primary diagnosis	Liver Segment	Liver lesion size in mm	FNAC or Biopsy Done	FNAC/ BIOPSY report	No. of liver lesions	Smear Cellularity	Radiological Diagnosis
1	66	M	LUNG	III	16	Biopsy	METASTASIS	>5	Adequate	Metastasis
2	66	F	COLON	V	19	Biopsy	METASTASIS	5	Adequate	Metastasis
3	62	F	BREAST	III	5	FNAC	REGENERATIVE NODULE	3	Cellular	Suspicious
4	42	F	BREAST	VIII	5	FNAC	REACTIVE ATYPIA	1	Scanty cellularity	Suspicious
5	69	M	RECTUM MELANOMA	III	6	FNAC	METASTASIS	>5	Cellular	Metastasis
6	44	M	RECTUM	IVB	6	FNAC	METASTASIS	>5	Cellular	Metastasis
7	48	M	LUNG	III	8	FNAC	METASTASIS	>5	Cellular	Metastasis
8	64	M	LUNG	IVA	8	FNAC	METASTASIS	2	Cellular	Metastasis
9	65	F	URINARY BLADDER	VIII	8	FNAC	METASTASIS	2	Cellular	Metastasis
10	56	F	COLON	VII	10	FNAC	METASTASIS	4	Cellular	Metastasis
11	55	M	PANCREAS	II	11	FNAC	METASTASIS	1	Cellular	Metastasis

12	36	F	BREAST	III	11	FNAC	METASTASIS	>5	Scanty cellularity	Metastasis
13	38	F	CERVIX	III	12	FNAC	METASTASIS	>5	Cellular	Metastasis
14	50	M	BUCCAL MUCOSA	VIII	12	FNAC	METASTASIS	1	Scanty cellularity	Metastasis
15	41	M	RECTUM	VII	13	FNAC	METASTASIS	2	Cellular	Metastasis
16	46	F	RECTUM	VIII	13	FNAC	BENIGN BILE DUCT LESION (BILE DUCT ADENOMA	1	Cellular	Metastasis
17	75	F	COLON	V	13	FNAC	METASTASIS	2	Cellular	Metastasis
18	61	M	CRICOPHARYNX	IVB	14	FNAC	METASTASIS	2	Cellular	Metastasis
19	41	F	BREAST	IVA	14	FNAC	METASTASIS	1	Cellular	Metastasis
20	66	M	LUNG	III	16	FNAC	METASTASIS	>5	Cellular	Metastasis
21	60	F	BREAST	IVA	17	FNAC	METASTASIS	3	Cellular	Metastasis
22	45	F	ESOPHAGUS	III	19	FNAC	METASTASIS	1	Cellular	Metastasis
23	66	F	COLON	V	19	FNAC	METASTASIS	5	Cellular	Metastasis
24	53	M	UNDIAGNOSED	III	20	FNAC	CIRRHOTIC NODULE	3	Cellular	Regenerative nodule
25	49	F	BREAST	VII	20	FNAC	METASTASIS	1	Cellular	Metastasis
26	59	M	SOFT PALATE	VI	20	FNAC	METASTASIS	1	Necrotic Material	Suspicious for metastasis
27	69	F	BREAST	III	8	FNAC	METASTASIS	>5	Cellular	Metastasis
28	49	F	BREAST	III	12	FNAC	METASTASIS	2	Cellular	Metastasis

Table 1

Sr.No.	**Primary neoplastic site**	**Total no. Of Patients**	**%**
1	Breast	8	30.76
2	Buccal Mucosa	1	3.84
3	Cervix	1	3.84
4	Colon	3	11.54
5	Cricopharynx	1	3.84
6	Esophagus	1	3.84
7	Lung	3	11.54
8	Pancreas	1	3.84
9	Rectum	4	15.38
11	Soft Palate	1	3.84
12	Undiagnosed	1	3.84
13	Urinary Bladder	1	3.84

Table 2.

Sr.No.	**Liver Segment**	**Number of nodules**	**Percentage (%)**
1	II	1	3.57%
2	III	11	39.28%
3	IVA	3	10.71%
4	IVB	2	7.14%
5	V	3	10.71%
6	VI	1	3.57%
7	VII	3	10.71%
8	VIII	4	14.28%

Table 3

Sr.No.	**No. of liver lesions**	**Total no. Of patients**	**Percentage (%)**
1	1	8	30.77%
2	2	6	23.07%
3	3	3	11.53%
4	4	1	3.85%
5	5	1	3.85%
6	>5	7	26.92%

Table 4

Discussion

Liver is a common site of primary and secondary malignant tumors, secondary involvement / metastasis being more common. The most common site of primary malignancy metastasizing to the liver being carcinoma breast, lung and colon. (1)(2) In oncology, in diagnostic / staging as well as surveillance CT scanof patients, small liver lesions are frequently found. There are studies in the literature which showed that most of these small liver lesions are benign, however, significant number can be malignant.(3)(4) If these lesions are followed up, follow up time is significantly high with un-necessary increased imaging for benign lesions.(4)(5)(7) Significant number of these lesions remain indeterminate on MRI (7) and 18F FDG PET may have limitations in evaluation in these small lesions(17). When patient has known extra-hepatic malignancy, it becomes important to characterize these small liver lesions into benign and malignant, especially when imaging findings are atypical. Timely intervention of liver metastasis in selected patients has favorable prognosis and delay in diagnosis has poorer prognosis and reduced survival. (9)(10)(11)(12)(13)

New onset liver lesions in patients with known malignancy are looked with suspicion, but may not always be metastatic. Figure 6 describes a 64 years male patient, a case of carcinoma left lung on chemotherapy. Response evaluation CT scan shows a new onset 8 mm liver lesion while primary neoplastic lung mass was stable. The small liver lesion was FNAed and on cytology, it was metastatic, suggestive of disease progression. Figure 7 describes a 46 years female patient, a treated case of carcinoma rectum, on surveillance. Surveillance CT scan shows a new onset 13 mm liver lesion and appears metastatic on imaging; however, on cytology features were suggestive of bile duct adenoma which is a benign tumor. In our study, 3 out of 4 benign nodules were new onset on follow up imaging.

In our study, 19 (67.86%) out of 28 nodules were less than 1.5 cms and 9 (32.14%) nodules were less than or equal to 1 cm in size. 16 out of these 19 nodules (less than 1.5cm) (84.21%) were metastatic, 1 nodule (5.26%) was regenerative nodule, 1 (5.26%) nodule showed reactive atypia on cytology and 1 nodule (5.26%) turned out to be bile duct adenoma. 7 out of 9 (77.78%) nodules which were less than 1 cm turned out metastatic on cytology. The nodule, which turned out to be bile duct adenoma, was new finding on follow up CT scan in a known case of carcinoma rectum. Since new onset, radiologically, it was metastatic, but it did not show uptake on PET-CT. So USG guided FNAC was done and turned out to be bile duct adenoma of cytology. (Fig. 7) The small nodule, which turned out to be regenerative nodule, was 5 mm in size, background liver showed fatty changes and was resolved on follow up triphasic CT scan after 3 months. Size of the nodule which showed reactive atypia was 5 mm, the background liver showed grade III fatty changes and it was stable on follow up ultrasound after 3 months. All of these 3 benign nodules on cytology were new onset and all of them showed delayed enhancement on equilibrium phase of the contrast enhanced CT scan. This delayed enhancement is likely due to fibrous stroma in these nodules. Therefore, though most of new onset small liver lesions can be metastatic in patients with known primary malignancy, not all are. Thus, USG guided FNAC is extremely useful in differentiating between small benign and malignant liver lesions which has significant impact on patient management.

8 out of 26 patients (30.77%) had single liver lesion, out of these 6 were metastatic. 6 patients (23.07%) had 2 liver lesions, all were metastatic. So, in total 14 out of 26 patients (53.85%), just more than half of the patients, has either 1 or 2 liver lesions and turned out to be metastatic in 12 out of 14 patients (85.71%). 8 out of 26 patients (3.76%) had 5 or more nodules and all were metastatic. 4 patients (15.38%) had 3 to 4 liver lesions, the nodules in 2 patients turned out to be benign.

In our study, we found that 84.21% of liver nodules less than 1.5 cms and 77.78% of liver nodules less than

1 cms size were metastatic. 53.85% of patients had only 1 or 2 liver lesions and were metastatic in 85.71%. However, our findings are limited by the small sample size and our study does not calculate the prevalence of the small liver lesions. We emphasize on the importance of liver FNAC/biopsy of small liver lesions. In our study, FNAC was done in liver nodules, which had suspicious or indeterminate features on imaging. Unnecessary long term follow up and repeated imaging was avoided in these patients. Some patients may drop out on long follow up which can also be avoided by obtaining final cytological / histopathological diagnosis with FNAC or biopsy. Final tissue diagnosis on samples obtained with USG guided FNAC/biopsy helped in appropriate patient management.

At out institute, cost of USG guided FNAC INR 2750/-, INR 2750/- for USG guided biopsy, INR 3500/- for CT guided FNAC and INR 7500/- for CT guided biopsy. Also many times, for CT guided FNAC/biopsy, intravenous iodinated contrast material (ICM) needs to be injected to locate major vessels. ICM has adverse reactions which can range from mild urticaria to severe anaphylactic shock. (18)(19) Also, there is risk of acute kidney injury with the use of intravenous ICM. (20) Ultrasound color Doppler helps in evaluating the vascular anatomy and avoid the use of ICM. Ultrasound guided FNAC/biopsy is a real time procedure where FNAC/biopsy needle can be monitored real time with accuracy. While performing procedure under CT guidance, breathing movement and small size of lesion along with intermittent CT cuts taken for the guidance makes it difficult to target the lesion. Therefore, USG guided FNAC/biopsy is cost effective and safer as compared with CT guided FNAC/biopsy.

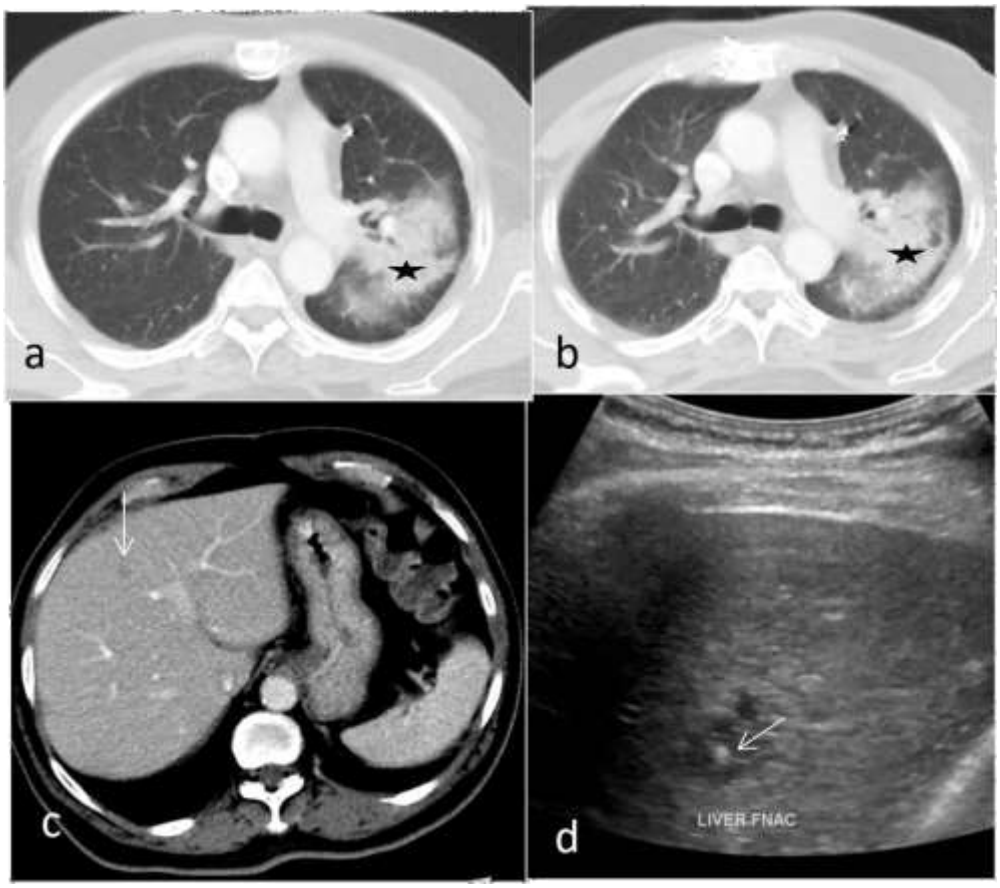

Figure 06: 64 Y / Male patient, known case of carcinoma left lung (asterisk in a) on chemotherapy. Followup CT scan revealed stable left lung mass (asterisk in b), but developed new 8 mm liver lesion (arrow in c). USG guided FNAC of the liver lesion was done (arrow in d showing bright tip of spinal needle in liver lesion). Cytology report suggestive of metastasis.

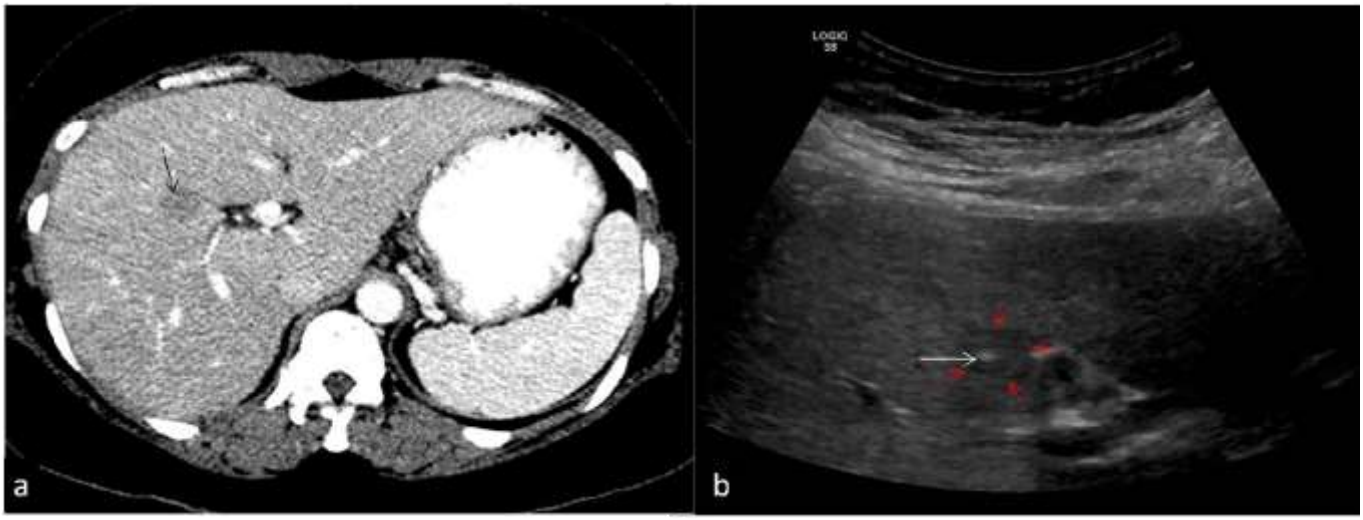

Figure 07: 46 Y/ Female patient, treated case of carcinoma rectum (post NACT-RT, post exenteration). She developed new onset 14 mm liver lesion on surveillance CT scan, 9 months after the surgery and also appeared metastatic on CT scan (arrow in a). USG guided FNAC was done from the liver lesion (red arrow in b denotes liver lesions and white arrow denotes tip of spinal needle in the lesion). Cytology report was suggestive of bile duct adenoma, which is a benign lesion.

Difficulties Encountered

There are some difficulties with ultrasound guided FNAC/biopsy procedures and most are patient related.

1. **Deep seated hepatic lesions in segment VII/VIII:** These deep seated lesions are sometimes beyond the reach of spinal needles which are routinely used in FNAC. Long 23 G 15 cms chiba needle shouldbe used for FNAC. Some lesions are seen only during deep inspiration, so after breath hold during inspiration needle can be advanced. Similar technique can be used for biopsy. (Fig. 2)
2. **Patient unable to breathhold:** It is preferable to do procedure during normal breathing and to advance the needle either during normal inspiration or expiration, in whichever the phase the lesion is more conspicuous.
3. **Proximity of lesions to the vessels:** It is preferable to insert needle parallel to the vessels, if the lesion is in close proximity to the vessels. Putting needles parallel to the vessels help prevent vessel transection while taking cores in biopsy. Also since it is a real time procedure, needle course can be modified / manipulated if required so that the vessels are avoided. (Fig. 2, 3 and 4)

4. **Patients with abnormal coagulation profile and low hemoglobin (Hb):** Usually blood coagulation profiles are not required for FNAC, unless the patient has history bleeding disorder, compromised liver function or obstructive jaundice. Blood coagulation profiles are must if biopsy is to be performed. Most of the cancer patients receive chemotherapy which suppresses the bone marrow and also cause hepatotoxicity with resultant low counts and deranged coagulation profile. Therefore, it is important to order fresh investigations in these patients.

    a. Deranged INR (International Normalised Ratio): INR less than or equal to 1.5 is acceptable. If INR is more than 1.5, vitamin K can be given. Generally, low dose oral vitamin K is sufficient to achieve INR below target level. (21) If INR is not corrected with vitamin K or in case of urgent biopsy, fresh frozen plasma can be given. It is preferable to do the biopsy while the transfusion is going on due to short life of clotting factors. (22)

    b. Low platelet: There are variations in the different studies about the minimum platelet count required for surgery and ranges from 50,000/mm3 to 1,00,000/mm3. (23) We prefer minimum platelet count more than 80,ooo/mm3 and is safer for liver biopsy. If low, then RDP / SDP can be infused. SDP raises platelet counts more than the RDP. (24)

    c. Low hemoglobin: It is preferable to have Hb value of 8 gm% and above. If Hb is low, then blood can be transfused and taken for the procedures after desired level is achieved. (25)

5. **Patients on anticoagulant**: If patient is on warfarin or other vitamin K antagonists, they should be stopped 5 days before biopsy.(26) If patient is on antiplatelet therapy (like aspirin, clopidogrel), stop them for 5 days before the procedure.(27) Some advice to continue low dose aspirin in low risk patient. But since we are solely dependent on the patient's hemostasis status to prevent bleeding complications and also we don't have dedicated vascular interventional setup at out institute, we prefer to stop aspirin. LMWH (low molecular weight heparin) should be stopped 24 hrs before the biopsy.(21)

6. **Requires expertise:** It definitely requires expertise to target small liver lesions, particularly for those located underneath the ribs and deep seated lesions.

Conclusion

Ultrasound guided FNAC / biopsy is cost effective, easily available and safer, less morbid procedure than open / surgical biopsy.(28)(29) However, there are some difficulties encountered when performing these procedures in cancer patients, which can be related to patient factors, like coagulation profile, liver lesions size / location or could be related to the operator performing the procedure, like expertise, localization of small liver lesions and deciding the correct needle path avoiding the vessels. We have also described the measures to be taken for these difficulties.

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