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"To Determine the Sensitivity of Enhancement of Focal Liver Lesions on Contrast Enhanced Usg In Comparison To Cect Abdomen"

Major (Dr) Gulab Singh Saroha, Dr (Maj) AparMathur, Col (Dr) R A George,
Command Hospital Airforce, Bangalore, Karnatak
Command Hospital Airforce, Bangalore, Karnataka
Command Hospital Airforce, Bangalore, Karnataka

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ABSTRACT:Aim: To determine if the enhancement of focal liver lesions on contrast enhanced USG has adequate sensitivity comparable to enhancement on CECT, thereby making use of contrast enhanced USG as a follow up modality in cases of focal liver lesions.

Methods:

a) Patients reported to the department of Radiodiagnosis for ultrasound who were found to have focal liver lesions were part of the study. 30 patients with enhancing focal lesions of liver (HU difference of 20 on CECT abdomen) primarily diagnosed on USG and undergone CECT scan from October 2018 to Mar 2020 were prospectively evaluated using CEUS.
b) The CEUS parameters were:
c) Contrast medium – Freshly prepared microbubbles of Sulfur Hexafluoride (SonoVue, Bracco).

- Dose – 4-5 ml
- Contrast administration: Freshly prepared contrast microbubble suspension (by mixing the powder with solvent provided with the vial)was administered as a bolus injection followed by a flush of 5 ml of normal saline (0.9 %).
- Equipment – GE Logiq F8 USG machine, using curvilinear probe of 4-6 MHZ.

Results: Out of 34 focal liver lesions showing enhancement on CECT abdomen 32 lesions were also showing enhancement on CEUS.

The sensitivity, PPV and diagnostic accuracy of CEUS with 95% CI was 94.12 (80.32 -99.28), 100 (89.11 – 100%) and 94.12% (80.32 – 99.28) respectively. The area under ROC curve was 0.930.

Our study showed that CEUS is a sensitive modality to show enhancement of FLL in comparison to the CECT enhancement.

Conclusion:CEUS can objectively demonstrate contrast enhancement comparable and corresponding to enhancement of same lesion on CECT. Hence beside its ability in following up enhancing FLL after their initial CECT, it also holds potential as a practical alternative to study enhancement in subset of such patients as in young patients or those with renal failure, allergies to contrast agents or claustrophobia.

I. INTRODUCTION

Focal liver lesions (FLL) are localized area of liver tissue that is identifiable as an abnormal part of the liver. The term "lesion" rather than "mass" was preferred because "lesion" is a term that has a wider application, including solid and cystic masses. (1)

The accurate characterization and early management of liver lesions requires a collaborative approach between different disciplines including radiologist, gastroenterologist, pathologist, hepatobiliary surgeon, and oncologist. (1)

Although majority of incidentally discovered liver lesions are benign, their noninvasive diagnosis is necessary. The optimal characterization of focal liver lesions and exclusion of malignancy assumes keyimportance in individuals with high-risks like in patients with family history of malignancy, known case of liver cirrhosis or hepatitis. (2)

Unfortunately, dedicated imaging is often needed to characterize focal liver lesions, because most lesions demonstrate nonspecific findings at initial gray-scale ultrasonography (USG) or single-phase computed tomography (CT). Traditionally, multiphase CT or contrast enhanced magnetic resonance (MR) imaging has been resorted to as problem solving modality in the detailed evaluation of hepatic lesions. However, due to radiation and contrast related limitations with multiphase CT and because of the limited access and high cost of MR imaging, contrast agent–enhanced USG (CEUS) should be considered as a safe, noninvasive, and easily available option. A growing body of evidence suggests that CEUS is a valuable,

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accurate, and economic tool for evaluation of hepatic lesions (2) , often complementing the results of CT and MR imaging and in some instances acting as an important alternative, Particularly in young patients or those with renal failure, allergies to contrast agents, or Claustrophobia. (2)

If contrast enhanced USG is found to be as sensitive as CECT to detect the enhancement in a focal liver lesion, and then contrast enhanced USG will be an ideal option for the follow up of patients with focal liver lesions.

II. METHODOLOGY

Patient Population:

a) Consecutive patients reporting to various Depts of this tertiary care hospital for investigations and management, who were identified to have focal liver lesions on preliminary evaluation by USG Abdomen formed the patient population for this study. Patients with enhancing focal lesions of liver primarily diagnosed on USG and undergone CECT scan from October 2018 to Mar 2020 were prospectively evaluated using CEUS.

b) During this period, after obtaining written consent, we performed Contrast enhanced ultrasound of patients with focal lesions of liverwhich showed enhancement (HU difference of 20) on CECT Abdomen. The enhancement of the lesion on the Contrast USG was assessed at 60 second and images/video saved for the procedure.

c) Total number of 30 patientswere included in the study.

d) Inclusion Criteria:

1. Patients with focal lesion of liver on USG.
2. Patients who have undergone dual phase CT scan of abdomen and detected to have enhancing focal liver lesion.
3. Patients older than 18 years of age.

e) Exclusion Criteria:

1. Patient not giving consent for contrast enhanced USG/CECT.
2. Patients with suboptimal CECT study either due to poor breath hold, suboptimal administration of intravenous contrast.
3. Patients with suboptimal CEUS study either due to poor breath hold, suboptimal administration of intravenous contrast, suboptimal visualization of area of interest.
4. Clinical interval between CECT abdomen and CEUS of more than 4 weeks.
5. Patients who have undergone interventional or surgical treatment for the enhancing focal liver lesions.
6. Lesion lesser than 1 cm of size.

Procedure:

a) Contrast medium – Freshly prepared microbubbles of Sulfur Hexafluoride (Sonovue, Bracco).

b) Dose – 4 to 5 ml.

c) Equipment – GE Logiq F8 USG machine, using curvilinear probe of 4-6 MHZ

d) Preparation for study– After explaining procedure and written consent, intra-venous line was secured on patient's peripheral vein, having diameter of 16 or 18 G(less than 20G). Scanning started with conventional B-mode(brightness mode) selected on the USG machine to identify the target lesion. The scanner is then switched to low mechanical index (MI) contrast-specific imaging mode. A dual screen format showing a low MI B-mode image alongside the contrast-only display is selected to aid anatomic guidance.

e) Contrast administration: Freshly prepared contrast microbubble suspension (by mixing the powder with solvent provided with the vial)was administered as a bolus injection followed by a flush of 5 ml of normal saline 0.9 %

DATA Collection

a) Representative images and video clips were saved on the hard disk of scanner/ workstation of the department for future reference.

b) The results of the study were recorded in the form of presence or absence of appreciable enhancement of the targeted lesion of the liver at 60 seconds,

c) The HU values of the lesion/enhancing part of the focal liver lesion from the CECT abdomen study of the same patientwere taken from the non-contrast images and images from the porto-venous phases of the study. The lesion/part of the lesion were assessed for enhancement on the contrast enhanced USG.

d) All findings endorsed on proforma based data sheet for collating data.

Statistical methods:

CT enhancement and CEUS enhancement of FLLs were considered as primary outcome variables. Age, gender, pre-contrast HU of lesion, post contrast HU of lesion, enhancement as HU differences were considered as primary explanatory variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Non-normally distributed quantitative variables were summarized by median and

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interquartile range (IQR). Data was also represented using appropriate diagrams like bar diagrams and pie chart.

All Quantitative variables were checked for normal distribution within each category of explanatory variable by using visual inspection of histograms and normality Q-Q plots. Shapiro- Wilk test was also conducted to assess normal distribution. Shapiro - Wilk test p value of >0.05 was considered as normal distribution.

Categorical outcomes were compared between study groups using Chi square test /Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used.)

CT enhancement was considered as gold standard and CEUS enhancement was considered as screening test. The sensitivity, specificity, predictive values and diagnostic accuracy of the screening test along with their 95% confidence interval (CI) were presented. Reliability of the screening test was assessed by kappa statistic along with its 95% CI and p Value.

The CT enhancement in predicting CEUS enhancement was assessed by Receiver Operative curve (ROC) analysis. Area under the ROC curve along with its 95% CI and p value are presented. Based on the ROC analysis, it was decided to consider difference of HU value of 27.5 between pre and post contrast CT attenuation as the cut off value. The sensitivity, specificity, predictive values and diagnostic accuracy of the screening test with the decided cut off values along with their 95% CI were presented.

P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

III. RESULTS

This prospective study included a total of 30 patients with the total of 34 lesions for final analysis. The patients in study ranged in age from 24 years to 83 years (table 6) with mean age of the study population being 53.43 ± 13.44 years. (95% CI 48.41 to 58.45). (Table 6)

Table 6: Age in study population (N=30)

Parameter	Mean ± SD	Median	Minimum	Maximum	95% C. I	
					Lower	Upper
Age	53.43 ± 13.44	54.50	24.00	83.00	48.41	58.45

Among the study population, 22 (73.33%) participants were male and 8 (26.67%) participants were female. (Figure 6).

Among the distribution of the lesions under study, 21(61.76%) lesions were in the right lobe, 11 (32.35%) were in the left lobe and 2 (5.88%) were distributed in both lobes. (Table 7).

Table 7: Distribution of lesions on USG/CT (N=34)

Lesion distribution on USG-CT	Frequency	Percentage
Right lobe-	21	61.76%
Seg - V	02	5.88%
Seg – VI	07	20.58%
Seg - VII	06	17.64%
Seg - VIII	02	5.88%
More than 01 Segment	04	11.76%
Left lobe –	11	32.35%
Seg – I	00	0.00%
Seg – II	04	11.76
Seg – III	01	2.94%
Seg - IV	06	17.64%
Both lobes -	02	5.88%

On gray scale evaluation of these lesions, 17 (50%) lesions were heteroechoic in appearance, 12 (35.29%) were hyperechoic scale, 4 (11.76%) were hypoechioic scale and 1 (2.94%) lesion was Ill-defined/isoechoic on gray scale.(Table 8).

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Table 8: Gray scale appearance of the lesions (N=34)

Gray Scale	Frequency	Percentages
Heteroechoic	17	50.0%
Hyperechoic	12	35.29%
Hypoechioic	04	11.76%
Ill-defined/isoechoic	1	2.94%

Among the 34 lesions studied, 32 (94.12%) lesions were showing CEUS enhancement.

Among the lesions included in our study, 10 (29.41%) were hemangioma, 9 (26.47%) were hepatocellular carcinoma (HCC) and 15 (44.11%) were metastatic lesions in the liver from primary being other than liver. (Table 9,10;figure 9).

Table 9: Diagnosis in the study population (N=30) and lesions (N=34)

Diagnosis	Frequency (patients)	Frequency(lesions)	Percentages (Patients/Lesions)
Hemangioma	08	10	26.67/29.41
Hepatocellular carcinoma (HCC)	07	09	23.33/26.47
Metastasis	15	15	50.0/44.11

Table 10: Primary source of the lesion in the study population (N=30)

Hepatic or Extra Hepatic	Frequency	Percentages
Hepatic	15	50.0%
Extra hepatic	15	50.0%

The mean Pre-Contrast HU of lesion was 33.82 ± 8.24 with minimum value being 11 and maximum was 50 in the lesions (95% CI 30.95 to 36.7).The mean Post Contrast HU of lesions was 79.47 ± 23.65, minimum was 48 and maximum was 134 in the lesions (95% CI 71.22 to 87.72). The mean HU of enhancement (difference between pre and post contrast HU) was 45.91 ± 21.51 with minimum value of 21 and maximum value 99 in the lesions (95% CI 38.28 to 53.54). (Table 11).

Table 11: Average Pre contrast HU and post contrast HU of the lesions (N=34)

Parameter	Mean ± SD	Median	Minimum	Maximum	95% C.I	
					Lower	Upper
Pre-Contrast (HU of Lesion)	33.82 ± 8.24	35.00	11.00	50.00	30.95	36.70
Post Contrast (HU of Lesion)	79.47 ± 23.65	78.50	48.00	134.00	71.22	87.72
Enhancement (HU lesion) (N=34)	45.65 ± 21.23	37.00	21.00	99.00	38.24	53.06

Out of 34 lesions taken in our study, which were showing enhancement on CECT, 32 (94.12%) were showing enhancement on the CEUS also. (Table 12).

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Table 12: Descriptive analysis of lesions on CEUS (N=34)

Enhancement (CEUS)	Frequency	Percentages
Yes	32	94.12%
No	2	5.88%

The enhancement on CEUS had sensitivity of 94.12% (95% CI 80.32% to 99.28%) as compared to the CECT. Positive predictive value was 94.12% (95% CI 80.32% to 99.28%), and the total diagnostic accuracy was 94.12% (95% CI 80.32% to 99.28%). The specificity, false negative rate and negative predictive value was not calculated as there were no controls taken in the study. (Table 13 and 14).

Table 13: Comparison of CEUS enhancementwith CT enhancement (N=34)

Enhancement (CEUS)	Enhancement (CT)	
	Yes (N=34)	No (N=0)
Yes	32 (94.12%)	0 (0%)
No	2 (5.88%)	0 (0%)

*** No statistical test was applied-due to 0 subjects in the cell**

Table 14: Predictive validity of CEUS enhancementin predicting CT enhancement (N=34)

Parameter	Value	95% CI	
		Lower	Upper
Sensitivity	94.12%	80.32%	99.28%
False negative rate	5.88%	0.72%	19.68%
Positive predictive value	100.00%	89.11%	100.00%
Diagnostic accuracy	94.12%	80.32%	99.28%

On ROC analysis, the HU difference (between pre contrast and post contrast CT) was found to have good predictive validity in predicting CEUS enhancement, as indicated by area under the curve of 0.930(95% CI 0.806 to 0.065, P value 0.044).

Out of 32 lesions showing CEUS enhancement, 31 (96.88%) lesions were high (>27.5) HU difference and 1 (3.13%) participants belongs to low (<=27.5) HU difference.

The HU difference of 27.5 was found to have high sensitivity of 96.88% (95% CI 83.78% to 99.92%) in predicting Enhancement (CEUS). Specificity was 50% (95% CI 1.26% to 98.74%), false positive rate was 50% (95% CI 1.26% to 98.74%), false negative rate was 3.13% (95% CI 0.08% to 16.22%), positive predictive value was 96.88% (95% CI 83.78% to 99.92%), negative predictive value was 50% (95% CI 1.26% to 98.74%), and the total diagnostic accuracy was 94.12% (95% CI 80.32% to 99.28%). (Figure 1;table 15&16).

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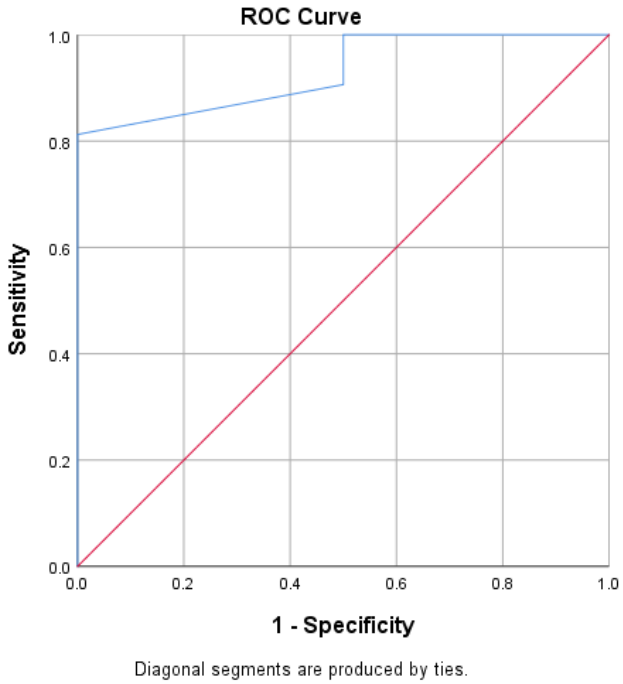

Figure 1: Predictive validity of HU difference (pre and post contrast CT) in predicting CEUS enhancement (ROC analysis)

Table 15:Area under curve and ROC analysis

Test Result Variable(s): HU difference				
Area Under the Curve	Std. Error	95% Confidence Interval of AUC		P value
		Lower Bound	Upper Bound	0.044
0.930	0.063	0.806	1.000	

Table 16: Comparison of HU difference (pre and post contrast CT) withCEUSenhancement(N=34)

HU difference	**Enhancement (CEUS)**		**Chi square**	**Fisher exact P value**
	Yes (N=32)	**No (N=2)**		
High (>27.5)	31 (96.88%)	1 (50%)	7.471	0.116
Low (<=27.5)	1 (3.13%)	1 (50%)		

Table 17: Predictive validity of HU difference (pre and post contrast CT) in predicting CEUS enhancement (N=34)

Parameter	**Value**	**95% CI**	
		Lower	**Upper**
Sensitivity	96.88%	83.78%	99.92%
Specificity	50.00%	1.26%	98.74%
False positive rate	50.00%	1.26%	98.74%
False negative rate	3.13%	0.08%	16.22%
Positive predictive value	96.88%	83.78%	99.92%

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Negative predictive value	50.00%	1.26%	98.74%
Diagnostic accuracy	94.12%	80.32%	99.28%
Positive likelihood ratio	1.94	1.35	20.837
Negative likelihood ratio	0.06	0	0.672

IV. DISCUSSION

Most FLLs are detected incidentally during routine abdominal imaging examinations for other conditions (e.g., ultrasound), in staging or follow-up examinations in oncologic patients, or in setting of surveillance programs for chronic liver disease. [3]

Characterization of focal liver lesions forms a vital element in the majority of radiological practices. The accurate characterization of a focal liver lesion requires the assessment of morphological characteristics as well as enhancement patterns and vascularity within the lesion. Therefore, administration of a contrast agent, demonstrating the intratumoral vascularity and blood flow gives essential information for the characterization of focal liver lesions.[3,4]

Ultrasound is widely used as the primary imaging method in the diagnostic workup of abdominal conditions, although contrast-enhanced computed tomography (CECT) and magnetic resonance imaging (CEMRI) represent the gold standard in various diagnostic algorithms for the assessment of focal liver lesions. Over the last 15 years, continuously increasing evidence has emerged that contrast-enhanced ultrasonography(CEUS) may contribute to the characterization of FLLs in comparable results with CECT and CEMRI.[5]

We compared the enhancement of the focal liver lesions on CEUS for those lesions which showed enhancement on the CECT. The CEUS enhancement in the porto-venous phase (at 60 seconds) was taken as the most important criteria for distinguishing between malignant and benign FLLs in the portal and late venous phases, where the malignant FLLs have a wash-out pattern and the benign FLLs are hyper/isoechoic.[6]

Out of 34 lesions which were showing enhancement on CECT, 32 lesions were showing enhancement on CEUS also. 5 lesions were showing peripheral enhancement with central non-enhancing part on CECT, similar pattern was depicted on CEUS. Two lesions which were showing enhancement on CECT were not showing subjective enhancement on CEUS. There are various reasons for showing non-enhancement on CEUS, mostly due to the lesion being small in size, and with respiratory movement such small lesions were likely to be missed.[7]A 1-cm size threshold for characterization of lesions with CEUS is accepted by the Liver Imaging Reporting and Data System (LI-RADS) working group.[2]The size of one such lesion showing non-enhancement on CEUS in our study was 10 mm. CEUS may also have the same limitations as all USG techniques, i.e. in patients with obesity, especially in the visualization of small and deeply located lesions [2,7]. CEUS has reduced sensitivity and specificity in fatty liver, as in patients with fatty liver enhancement may not be visualized distinctly from liver parenchyma. [36] The second lesion in our study which was not showing enhancement on CEUS was 18.5 mm in size located in segment II of the liver in a patient with fatty liver. This lesion may have been missed due to inherited limitation of the USG, which may be the causing the poor enhancement of the lesion as well as juxta-diaphragmatic locationinduced motion artifact in our patient.

In our study, we compared sensitivity of enhancement of the lesion on CEUS in comparison to the enhancement on CECT, using contrast enhancementasbeing the indicator of vascularity and flow pattern in the lesion. FLLs which were showing enhancement on CECT were considered for CEUS enhancement study. The sensitivity, PPV, diagnostic accuracy and area under ROC curve were calculated for CEUS enhancement of the FLLs. The primary analysis in our study showed a high sensitivity of CEUS in comparison to CECT in enhancing FLLs. The sensitivity, PPV and diagnostic accuracy of CEUS with 95% CI was 94.12 (80.32 -99.28), 100 (89.11 – 100%) and 94.12% (80.32 – 99.28) respectively. The area under ROC curve was 0.930. On ROC analysis, the HU difference (between pre contrast and post contrast CT) of 27.5 was found to have higher sensitivity of 96.88% (95% CI 83.78% to 99.92%) in predicting Enhancement (CEUS), however, more studies are needed with larger sample size.

Sandrose et al. in their study on contrast enhanced ultrasound in indeterminate focal liver lesions on CT, examined the diagnostic accuracy of CEUS in diagnosis of focal liver lesions. The sensitivity, PPV and diagnostic accuracy of CEUS in CT indeterminate FLLs was 94.4 % (95 % CI:

56.3–99.5 %), 94.4 % (95 % CI: 56.3–99.5 %), and 98.7 % (95 % CI: 94.9–99.7 %) respectively. [35] The similar high sensitivity, PPV and positive predictive value was also found in our study with sensitivity, PPV and diagnostic accuracy of CEUS with 95% CI was 94.12 (80.32 -99.28), 100 (89.11 – 100%) and 94.12% (80.32 – 99.28) respectively.

Smajerova M et al. in their prospective cost-effectiveness analysison CEUS in the evaluation of incidental focal liver lesionsfound CEUS has a sensitivity of 96.99 and positive predictive validity of 94.16 in comparison with CT and MRI imaging in evaluation of the FLLs.[8] Similar results were obtained in our study showing high sensitivity and positive predictive value of CEUS for FLLs.

Tan Z et al[9] in a cohort of 45 patients with 46 lesions studied the comparative performance of contrast-enhanced ultrasound (CEUS) and contrast-enhanced CT or MRI (CECT/MR) in evaluating liver lesions using the LI-RADS guidelinesfound CEUS is useful for reassessment of lesions with intermediate probability on CECT/MRI. Mean area under ROC curve (AUC) for CEUS (0.994) was significantly higher than of CECT/MR (0.760) for all lesions (p=0.01). The area under curve for CEUS was 0.930 in our study which was comparable with the high area under ROC curve in the study conducted by Tan Z et al.

In Indian context, various studies compared CEUS with CECT and CEMRI for evaluation of FLLs. In study by Thakur et alon the role of contrast enhanced ultrasound in characterization of focal liver lesions[10] assessed the potential of CEUS in describing the enhancement pattern of FLLs and compared the diagnostic accuracy of CEUS with conventional sonography. Histopathological examination and CT/MR imaging were taken for establishing final diagnosis of FLLS. They found the sensitivity of CEUS in the range of 93.1 to 100 % in diagnosing various FLLs. The high sensitivity of CEUS in this study was comparable with the high sensitivity of 94.12 % (95% CI being 80.32 – 99.28%) in our study.

Manikadan P et al.[4] in characterization of FLLs using SonoVuefound CEUS as a promising approach in non-invasive characterization of focal liver lesions and useful as a first-line imaging modality clinically when a focal liver lesion is detectable first on USG. In their study, the diagnostic accuracy of characterizing HCC in CEUS (sensitivity 87%; specificity 90.9%; and positive predictive value 80%) was higher when compared to that of CECT (sensitivity 37.5%; specificity 93.3%; and positive predictive value 75%). In cases of hepatic metastasis the diagnostic accuracy of CEUS (sensitivity 94%; specificity 100%; and positive predictive value 100%) is higher when compared with CECT (sensitivity 92%; specificity 79%; and positive predictive value 85%) and gray-scale USG (sensitivity 65%; specificity 62%; and positive predictive value 69%). Diagnostic accuracy of both CEUS and CECT in characterization of hemangioma was found to be similar (sensitivity 100%; specificity 100%; and positive predictive value 100%), but was higher when compared to that of gray-scale USG (sensitivity 40%; specificity 92%; and positive predictive value 50%). The combined sensitivity, positive predictive value and diagnostic accuracy in our study was found to be comparable with the above study, though we have not assessed individual pathological entities separately.

In a pilot study on efficacy of contrast enhanced grey scale ultrasound in characterization of hepatic focal lesions, Joshi P et al[11] found CEUS increases diagnostic efficacy over unenhanced ultrasound but does nothave any significant advantages over multidetector CT (MDCT). The rate of correct diagnosis with CEUS was 72% as compared to the 92% with MDCT. However, in our study the sensitivity and diagnostic accuracy of CEUS was higher and comparable to CECT if only enhancement criteria was taken into consideration.

The sensitivity, positive predictive validity and diagnostic accuracy of CEUS in our study were comparable with previous studies conducted. USG evaluation of any FLLs detected during routine USG examination can be easily augmented with CEUS examination in the same setting without moving the patient and without any exposure of patient to ionized radiations and iodinated contrast media.

V. CONCLUSION

Contrast enhanced ultrasound is a promising modality with results comparable to contrast enhanced CT in focal liver lesions. Contrast enhanced sonography can potentially augment the diagnostic efficacy of ultrasonography in focal liver lesions, by virtue of its non–invasive, non–irradiating and real time imaging capability. CEUS holds promising utility as a first-line imaging technique in the non-invasive characterization of focal liver lesions, when a focal liver lesion is first detected on USG in clinical practice. It would also be a reliable alternative imaging study in patients with FLL and poor renal function, who cannot undergo contrast studies

using iodinated or gadolinium-based contrast media.

The present study shows that CEUS can predict the enhancement pattern of the focal liver lesion accurately with comparable results to contrast enhanced CT. Therefore, it can be incorporated in follow up imaging of focal liver lesions as a complimentary modality to routine USG.

Though currently the high cost of ultrasound contrast media preclude its routine use in liver applications, the likelihood of this cost coming down with increased adoption and availability holds promise for an increased utility role of this modality in the future.

VI. SUMMARY

Focal lesions in the liver have a wide aetiology. Many of these lesions are incidently detected which require a definitive diagnosis for planning of treatment. These lesions are regulary followed for assessment of treatment or for recurrence afer treatment. Their diagnosis and characterization require evaluation of their vascularity and hence they require contrast study in the form of CECT or CEMRI as preferred modality. However, these modalities are associated for various side effects and limitation in certain patient groups (as CECT in renal failure andcontrast allergy and MRI in claustrophobic patients) and less availability. CEUS provides a good alternative for these lesions for diagnosis and in regular follow up. In our pilot study we have tried to compare the sensitivity of enhancement of FLLs on CEUS in comparison with CECT enhancement.30 patients with a total of 34 FLLs were included in this study. The study showed that CEUS has a high sensitivity, positive predictive value and diagnostic accuracy when compared with CECT for enhancement of FLLs.

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