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Multidetector Computed Tomography and Ultrasound Role in Evaluation of Focal Hepatic Lesions with Pathological Correlation

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A B S T R A C T

Introduction:This study aims to determine the role of USG and MDCT with pathological correlation in evaluation of focal hepatic lesions in arriving at a specific diagnosis before surgery.***Material and Methods:***A total number of 30 patients with liver lesions who were referred to Department of Radiodiagnosis, SSIMS & RC, Davanagere.***Results:*****Correlation of ultrasound diagnosis with histopathology**.The sensitivity of diagnosing cholangiocarcinoma is 50%, abscess is 85.71 and HCC is 80%. Whereas for FNH, Metastasis and hydatid cyst it was 100%. The specificity for all the focal hepatic lesions mentioned was 100% except for metastasis which was 77.7%.***Correlation of CT diagnosis with histopathology*****:** The sensitivity of diagnosing abscess is 71.42%. Whereas for all other FLL it was 100%. The specificity for all the focal hepatic lesions mentioned was 100% except for metastasis which was 94.4%, HCC was 96%.***Conclusion*****:** Contrast enhanced computed tomography with ultrasonography and histopathological correlation is a sensitive tool for diagnosing focal hepatic lesions and differentiating between benign and malignant lesions with high accuracy.

Keywords: HCC, Metastasis, Focal liver lesions, USG, CT.

INTRODUCTION

The liveris well-supplied with blood via the hepatic artery and portal vein [1]. FLLs (focal liver lesions) are commonly seen in day today practice and require further evaluation and investigations. As a result, for a clear diagnosis, the doctor must rely on imaging modalities and pathology. Because of the extensive use of imaging techniques, these lesions are being discovered more frequently. According to a few investigations, incidental FLLs were discovered in up to 33% of radiological examinations and more than50% of autopsy cases [2].

FLLs can be categorised into three: first, benign lesions for which usually no treatment Is needed (hepatic hemangioma, focal nodular hyperplasia (FNH), benign liver cyst, and focal fat sparing); second being benign lesions for which treatment is required (hepatic adenoma, adenomatosis, biliary cystadenoma, hepatic abscess, echinococcal cyst, granulomatous inflammation and inflammatory pseudotumor of the liver); and third ismalignant mass lesions for which treatment is always required if feasible (hepatocellularcarcinoma (HCC), cholangiocarcinoma, liver metastases from other primary sites, biliarycystadenocarcinoma, hepatic angiosarcoma and lymphoma) [3].

Various modalities include X-rays, arteriography, radionuclide scanning, ultrasound and,since the 1970s, computed tomography (CT) and magnetic resonance imaging (MRI).These are the non-invasive techniques that can be used to identify and characterise lesions. Although non-invasive diagnosis is more convenient and safe, intrusive diagnosis is the only way to be sure [4, 5].

In terms of characterisation and delivering crucial preoperative information, CT has the upper hand. Despite recent data showing that MRI has a comparable rate in identification and categorization of focal liver lesions, CT is an

ideal imaging technology due to its rapid availability and low scanning time. As a result, multi–detector row helical CT (MDCT) is a rapidly growing method that can scan the entire liver in 10 seconds or less, allowing for the capture of both early and late arterial hepatic images [4].

Dynamic CT and grey scale ultrasound have been the primary imaging modalities for focal liver lesions for more than two decades. Many clinical problems may be answered using both procedures, and if a single technique cannot provide a definitive diagnosis, combining the two is typically beneficial.

Ultrasonography is typically the first test utilised to assess patients with localised or diffuse hepatic illness due to its extensive use and availability. Due to its doppler and colour flow capabilities, ultrasound imaging will continue to be an important modality forhepatic imaging, particularly in the evaluation of portal vein patency and hepatic arterythrombosis. The use of computed tomography (CT) to visualise focal hepatic lesions andtheir response to contrast medium is quite useful [3].

Hence this study was taken up in our tertiary care facility to correlate the ultrasonography, CT and pathological correlation in the evaluation of focal hepatic lesions.

Inclusion Criteria

Patients of all age group attending department of radio diagnosis and who are diagnosed with focal liver lesions.

Exclusion Criteria:

Patients who were diagnosed with

1. Diffuse liver lesions
2. Simple hepatic cysts
3. Hemangiomas
4. Pregnant or nursing mother
5. Blood diathesis
6. FNAC/Biopsy show inadequate material for definitive diagnosis.

MATERIALS AND METHODS

The present study was conducted in outpatient clinic of the Department of Radiodiagnosis, SSIMS & RC, Davanagere, from July 2022 to December 2023**.** Institutional ethical clearance was obtained for the study by the Institutional Review Board.

Study design: Prospective observational study.

Study place: Department of Radiodiagnosis, SSIMS& RC, Davanagere.

Study duration: July 2022 to December 2023.

Sample Size: 30

Equipment used–

GE LOGIQ S7 XPERT

GE REVOLUTION 128 slice MDCT Scanner.

Scanning Technique:

Ultrasonography of liver imaging was obtained with GE LOGIQ S7 XPERT with the curvilinear probe (frequency range 1-5MHz).

Contrast enhanced CT of liver imaging using General Electrical (GE) Revolution 128 slice CT machine. Images from the level of diaphragm to the pubic symphysis and multiplanar MIP / MPR reconstructions were post-processed from the volumetric data

Contrast: 60 - 80 mL of iohexol was injected intravenously through a 20-gauge cannula at a rate of 3.5 ml/sec with an automated dual headed pressure injector.

FNAC/BIOPSY: Specimens obtained from USG and MDCT guided procedures and done by 10 ml syringe, 22-gauge spinal needle with stylet/ 18 G true cut biopsy needle under local anesthesia. Specimens sent to pathological departments for processing and diagnosis.

Statistical Method:

Statistical data analyzed by statistical software version 20 (SPSS) with appropriate tests of significance.

RESULTS

Study group consists of 17 male and 13 female patients. In our study of 30 patients, 2 were in the age group 11-20 years, 1 each in age group 21-30 and 31-40 years, 5 in the age group 41-50 and 61-70 years, 6 in age group 51-60 years and 8 in age group 71-80 years.

In our study, on USG 17 had multiple lesions, 9 had single lesions and 4 had two lesion with 15(50%) of patients had hypoechoic lesions, 11(36.7%) had heteroechoic lesions and 2(6.7%) patients each had anechoic and hyperechoic lesions

In ultrasound, 16(53.3%) were metastasis, 6(20%) abscess, 4(13.3%) HCC, 2(6.7%) hydatid cyst, 1(3.3%) were diagnosed with cholangiocarcinoma& focal nodular hyperplasia.

On CT, more than half the patients, 18 had multiple lesions as observed in CT followed by single lesions in 8 and two lesions in 4 patients. Majority, 29 patients (96.7 %) had hypodense and 2 patients had heterogenous lesion. Out of 30 patients, calcification present in 3(10%) patients only.

Contrast enhancement CT findings-arterial was enhancing type in 21(70%) of patients, enhancing wall was seen in 7(23.3%) patients and non-enhancing in 2(6.7%) patients. In venous, it was equilibrium in 13(43.3%) patients, enhancing wall in 8(26.7%), non- enhancing in 2 (6.7%) and enhancing in 1 patient. In delayed it was equilibrium in 12(40%) patients, washout in 8(26.6%) patients, enhancing wall in 6(20%) of patients, and 2 each patient in enhancing and non-enhancing category.

In CT, 13(43.3%) were metastasis, 6(20%) were HCC, 5(16.7%) abscess, 2(6.7%) hydatid cyst and cholangiocarcinoma, 1(3.3%) patient each was diagnosed with granulomatous disease and focal nodular hyperplasia.

In HPE, 12(40%) were metastasis, out of which metastasis were from carcinoma of stomach, adenocarcinoma, squamous cell carcinoma of esophagus and primary carcinoma of lung. There were 5(16.7%) HCC patients and it was well differentiated. Among patients who had abscess, 13(3.3%) had positive pus culture, 2 (6.7%) had granulomatous abscess and 1 (3.3%) showed no pus growth. There were 2 (6.7%) patients of cholangiocarcinoma, 2 (6.7%) hydatid cyst and 1(3.3%) unspecified hyperplasia.

Table 1: Correlation of CT Diagnosis with Histopathology

Diagnosis	True Positive	False Positive	False Negative	True Negative	Total	Sensitivity	Specificity	PPV	NPV	Accuracy	P Value
Abscess	5	0	2	23	30	71.42	100	100	92	93.3	<0.001**
Cholangiocarcinoma	2	0	0	28	30	100.00	100.00	100.00	100.00	100.00	<0.001**
FNH	1	0	0	29	30	100.00	100.00	100.00	100.00	100.00	0.03**
HCC	5	1	0	24	30	100.00	96.00	83.3	100.00	96.7	<0.001**
Metastasis	12	1	0	17	30	100.00	94.4	92.3	100.00	96.7	<0.001**
Hydatidcyst	2	0	0	28	30	100.00	100.00	100.00	100.00	100.00	<0.001**

Table 2: Correlation of USG Diagnosis with Histopathology

Diagnosis	True Positive	False Positive	False Negative	True Negative	Total	Sensitivity	Specificity	PPV	NPV	Accuracy	P Value
Abscess	6	0	1	23	30	85.71	100.00	100.00	95.83	96.67	<0.001**
Cholangiocarcinoma	1	0	1	28	30	50.00	100.00	100.00	95.55	96.7	0.066
FNH	1	0	0	29	30	100.00	100.00	100.00	100.00	100.00	<0.001**
HCC	4	0	1	25	30	80.00	100.00	100.00	96.15	96.7	<0.001**
Metastasis	12	4	0	14	30	100.00	77.7	75.00	100.00	86.7	<0.001**
Hydatidcyst	2	0	0	28	30	100.00	100.00	100.00	100.00	100.00	<0.001**

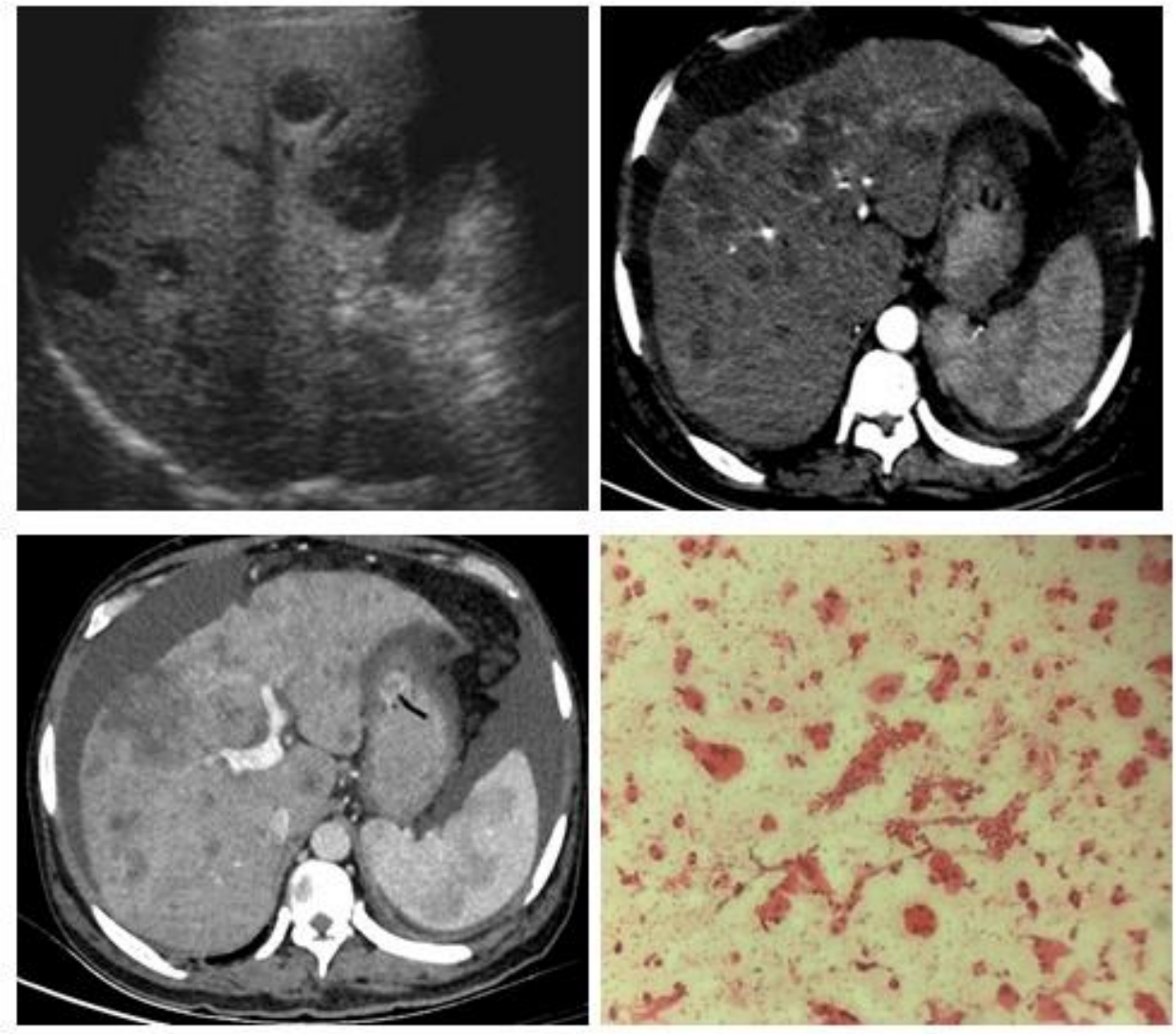

Figure 1: Radiologically diagnosed case of hepatic metastasis on USG & CT, correlating with histopathological findings

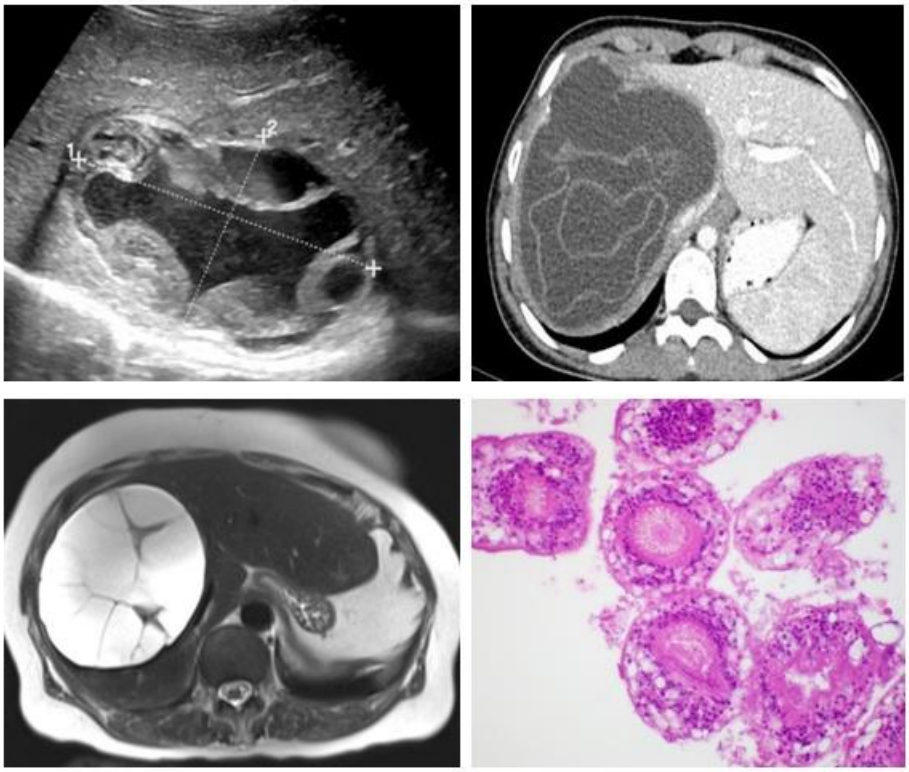

Figure 2: Radiologically diagnosed case of Hepatic hydatid cyst on USG & CT correlating with histopathological findings

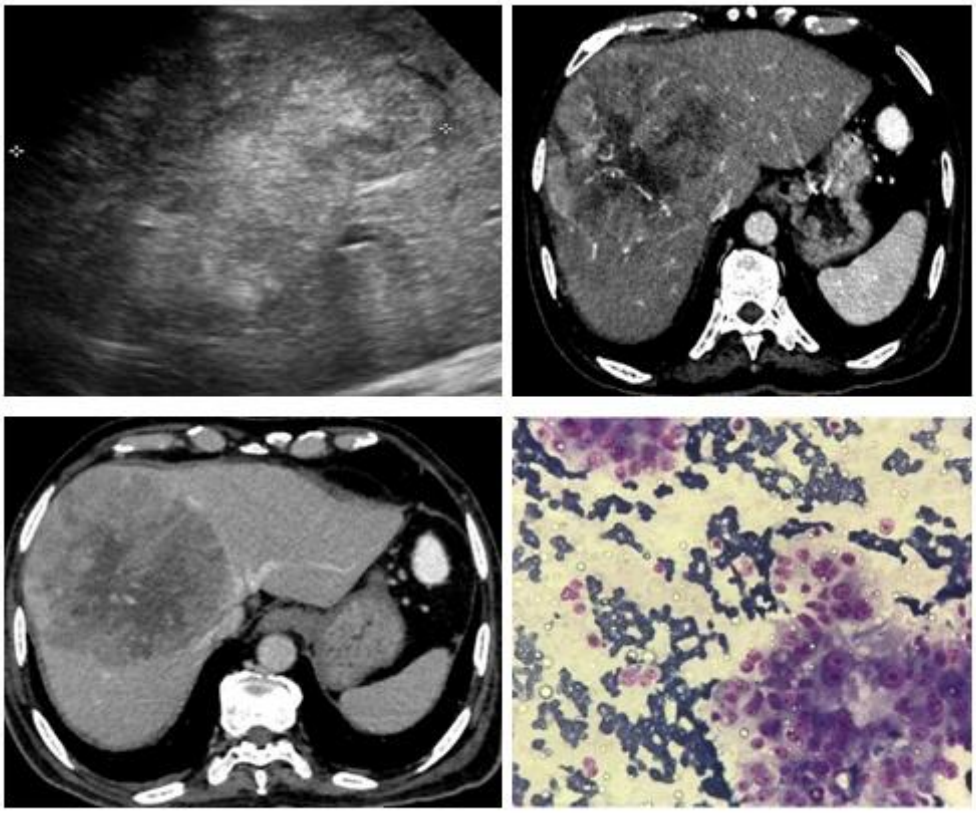

Figure 3: Radiologically diagnosed case of Hepatocellular carcinoma on USG & CT correlating with histopathological findings

DISCUSSION

In our study 30 patients whose age ranging from 17-86 years with clinically suspected liver disease were compared radiologically and pathologically in SSIMS & RC.

Age group:

In our study most of the patients, 26.7% were in the age group 71-80 years. Similarly, in the study done by YVRS Aparna*et al.*, [3] and their colleagues [6], the most common age group was 61-70 years. Likewise in the study doneby Bali S*et al.*, [6] and their colleagues [7], the maximum numbers of patients were from age group 51-60 years.

Gender:

In our study, there was a male preponderance 17 (56.7%). Similarly, male preponderance (54%) was seen in YVRS Aparna*et al.*, [3] and their colleagues study [6] and in Bali S*et al.*, [6] and their colleagues [7].

USG Findings:

In our study, more than half the patients, 17(56.7%) had multiple lesions and 15(50%) of patients were hypoechoic. The diagnosis showed the following results: 16(53.3%) were metastasis, 6(20%) abscess, 4(13.3%) HCC, 2 (6.7%) hydatidcyst, 1(3.3%) patient each was diagnosed with cholangiocarcinoma and focal nodular hyperplasia. Of the 40 patients studied by Bali S *et al.*, [6] and their colleagues [7] with the help of USG, maximum cases were of hepatic abscess & Hepatocellular carcinoma 10 each (25%) respectively.

CT Findings:

In our study, more than half the patients, 18(60%) had multiple lesions and 29(96.7%) of patients had hypodense lesions and Calcification was seen in only 3(10%) patients. Contrast enhancement CT findings-arterial was enhancing type in 21(70%) of patients, enhancing wall was seen in 7(23.3%) patients and non-enhancing in 2(6.7%) patients. In venous, it was equilibrium in 13(43.3%) patients, enhancing wall in 8(26.7%), non- enhancing in 2 (6.7%) and enhancing in 1 patient. In delayed it was equilibrium in 12(40%) patients, washout in 8(26.6%) patients, enhancing wall in 6(20%) of patients, and 2 each patient in enhancing and non-enhancing category.

In CT, 13(43.3%) were metastasis, 6(20%) were HCC, 5(16.7%) abscess, 2(6.7%) hydatid cyst and cholangiocarcinoma, 1(3.3%) patient each was diagnosed with granulomatous disease and focal nodular hyperplasia.

Study done by Shreshta Jain*et al.*, [5]and their colleagues [8], among 84 patients had the following findings detected by MDCT. Out of 84, benign focal liver lesions were 72 (85.7%) and malignant lesions were 12 (14.3%). Among the benign lesions, abscess and malignant lesions,hepatocellularcarcinomawere of maximum cases.

In study done by Kamlesh Gupta *et al*., [3] and their colleagues [9], benign hepatic lesions accounted for 64 % of the cases and 36% were malignant, based on CT findings. Similar to our study, majority of benign lesions were well defined 87.5% and hypodense 64.06%. Peripheral enhancement on contrast administration was seen in 56.25% cases. Ill-defined margins and hypodense lesions were the hallmark in malignant hepatic masses, 77.77% cases. About 50% malignant lesions enhanced heterogeneously on contrast studies.

Metastases were the most common malignant hepatic lesions accounting for 72.22%. Sites commonly involved in metastases were from gall bladder, lung and colon, each accounting for 11.11% of the malignant hepatic lesions. Rest cases were of primary hepatic malignancies. The cases were, 13.88% of HCC, 8.33% of cholangiocarcinoma and 2.77% of fibrolamellar carcinoma and hepatoblastoma.

Sensitivity, Specificity, Accuracy, Correlation:

In our study, by USG, the sensitivity of diagnosing cholangiocarcinoma is 50%, abscess is 85.71 and HCC is 80%. Whereas for FNH, Metastasis and hydatid cyst it was 100%. The specificity for all the focal hepatic lesions mentioned was 100% except for metastasis which was 77.7% and accuracy was also least for this, 86.7%. The p value was statistically significant for all FLL except for cholangiocarcinoma. In study done by Bali S *et al*., [6]and their colleagues [7], USG was 100% sensitive in detection of hydatid cysts. Overall final diagnosis by USG showed 84.38% sensitivity and 67.74% specificity with PPV and NPV of 50.79%.

In CT, the sensitivity of diagnosing abscess is 71.42. Whereas for all other FLL it was 100%. The specificity for all the focal hepatic lesions mentioned was 100% except for metastasis which was 94.4%, HCC was 96%. The accuracy of abscess was 93.3, metastasis and HCC was 96.7, rest all were 100. The p value was statistically significant for all FLL.

In a study by Khalid M*et al.*, [9]and their colleagues [10], the diagnostic accuracy of metastatic focal hepatic lesions by MRI was 55% as compared with 17% for CT. In this study, more recent comparisons of non-invasive imaging

modalities, primarily MDCT and USG, have shown equally accurate.

Likewise in study done by Shreshta Jain *et al*., [5] and their colleagues [8] for the hepatocellular carcinoma cases, highly significant agreement ($p<0.001$) was found between MDCT and biopsy techniques. The overall sensitivity, specificity, PPV, NPV and diagnostic accuracy formalignant lesions was found to be 83.3%, 97.2%, 83.3%, 97.2% and 95.2% respectively. The hydatid cyst and hepatocellular carcinoma cases showed overall sensitivity and specificity of 97.4%, 96.1%, and 96.9%, 90.4%, respectively. The overall sensitivity, specificity, PPV, NPV and diagnostic accuracy of MDCT was found to be 97.9%, 96.6%, 87.9%, 97.9% and 96.7% respectively for cyst.

Hassan *et al*., [4] and their colleagues [11] showed sensitivity and specificity of hepatocellular carcinoma, the sensitivity and specificity of CT were 62% and 83.3%. In metastases, sensitivity and specificity of CT were 60% and 84%.

According to study done by Kamlesh Gupta *et al*., [3] and their colleagues [9], the sensitivity and specificity of multidetector CT scan for the detection and characterization of primary hepatic malignancies and metastasis was 87.5% and 98.5%, 100% and 98% respectively.

CONCLUSION

Imaging modalities like USG, CT have shown results comparable to histopathological findings. Even though sensitivity of USG in detecting liver metastasis is comparable to CT, CT was superior to it. Accuracy of CT was also more than USG in diagnosing metastasis and for all other hepatic lesions involved in the study it was similar to USG. Hence, such feasible noninvasive procedures can be used as a diagnosing modality, and it is safe also.

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