

The Role of USG and Triple Phase CT for Evaluation of Space Occupying Lesions Including Liver Hemangioma

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ABSTRACT

Purpose: To know the role of USG and triple phase CT for evaluation of space occupying lesions including liver hemangioma and to compare the diagnostic capability of CT Triple Phase and USG.

Method: This comparative study was conducted in SGT hospital. Data was collected of 25 patients for five months. Patients were taken >18 and < 75 years of age. Consent form was filled up by the patients and history was also taken. Diseases were diagnosed on both the modalities USG and CT and comparison was done after examine the patients.

Result: Out of 25 patients, 18 (72%) were males and 7 (28%) were females. Maximum number of diseases were diagnosed on CT Triple phase, in 17(68%) patients and less number of diseases were diagnosed on ultrasound, in 8(32%) patients. Out of 17 patients who underwent for CT Triple phase, maximum number of patients had liver abscess 6(35.29%), multifocal hepatic lesion and hepatic granulomas were in 1(5.88%) patients. Out of 8 patients who underwent for ultrasound, maximum number of patients had liver abscess in 3(37.5%) patients and multifocal hepatic lesion was found in 1(12.5%) patients. Cystic lesion and hepatic granulomas were not seen on ultrasound.

Conclusion: The sensitivity of liver triple phase was high as compare to the ultrasound which

was mainly noticed in liver abscess. USG must be performed in all the patients with clinical suspected hepatic masses for initial detection and localization of lesion.

Keywords: ultrasound, CT, liver, triple phase, lesion, hemangioma

INTRODUCTION

Liver is a special organ of digestive tract and also the largest gland of the body. Since, it has a major function of detoxification and rich blood supply, it becomes prone to various diseases. About 70% of blood from portal vein and 30% from hepatic artery is the normal blood supply to the liver parenchyma^[1]. Liver may be common site for space occupying lesions. Distinguishing these entities with imaging criteria alone turns to be complex and problematic, but certain focal liver lesions have classic ultrasonic, computed tomographic (CT) and magnetic resonance (MR) imaging features. Development in modern imaging techniques have led to the recognition of some incidental lesions that usually have no clinical relevance, e.g. Simple hepatic cysts^[2]. Liver diseases are the most common causes of morbidity and

mortality in India which are encountered in day to day practice^[3]. Description and distinguishing of benign focal liver lesions is one of the most confusing and controversial challenge in modern imaging^[1]. Conventional radiograph does not identify liver lesions unless calcified. Ultrasonography is most often used as the initial investigation to assess liver lesions. However, only gray-scale information alone cannot provide definitive diagnosis of mass or a lesion. Therefore, ultrasound is generally analysed further with contrast-enhanced CT or MRI for definitive characterization^[4]. Ultrasonography allows full liver scanning and accurate detection of various liver lesions. Ultrasound examinations are the most frequently used imaging method for the assessment of focal liver lesions. With its doppler and colour flow capabilities, ultrasound imaging is considered as an important modality for hepatic imaging^[5]. The main strength of hepatic sonography lies in its ability of detection of common benign lesions like cysts, haemangiomas. Moreover, it is safe and has low cost. Ultrasound is also used as the primary imaging investigation in patients with jaundice, right upper quadrant pain and hepatomegaly. CT has been the vital imaging tool for the assessment of different liver pathologies. It can help in detecting the severity of the hepatic masses and planning of treatment. The difference in pattern of blood flow forms the basis of triple phase scan of liver and this technique is used to illuminate the imaging features of benign and metastatic liver tumors^[1]. In distinguishing a benign lesion from malignant lesion, triple phase CT plays a crucial role. This also avoid the unnecessary invasive procedures^[6]. The fast data acquisition by CT allows successive scanning of entire liver at different phases after the administration of contrast medium. Thus, the multiphase liver CT is introduced and it allows contrast- enhanced imaging which is widely used for the detection and characterization of focal liver lesions^[5]. CT triple phase allows the imaging of liver in

three phases after the administration of contrast media^[3].

AIM

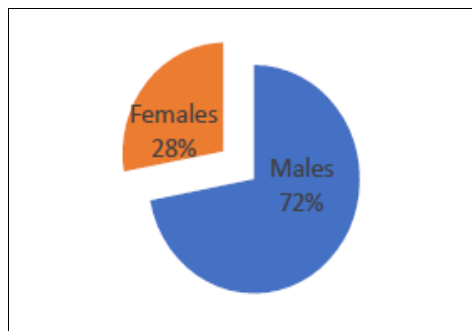
- This study was done to know the role of USG and triple phase CT for evaluation of space occupying lesions including liver hemangioma
- To compare the diagnostic capability of CT Triple Phase and USG

METHOD AND MATERIAL

Research design and methodology are fundamental aspects of the research process. These should be selected cautiously because the success of a research project relies heavily on them. This was a comparative study that was done by taking 25 patients who came into the department for their diagnosis at SGT hospital. Ultrasound and liver triple phase CT were done of those patients. The data was collected of 5 months from October 2020 to March 2021 under the supervision of experts and existing radiologist. Data was collected by the convenience sampling method as the data was taken from the section of population which was easily accessible or readily available to the researcher. All the patients of age group >18 and < 75 years were included in this study. Patients who had renal failure (raised serum creatinine), iodine sensitivity, pregnant patients, extremely obese patients, unwilling patients were excluded in this study. Consent form was filled up by the patients. Ultrasound examination was performed on Toshiba and GE Health Care machine. CT scan was done on 16 slice Siemens CT machine. Statistical analysis was done by using computer software (SPSS Software version 25). Qualitative data were expressed in proportion and percentages and quantitative data expressed as mean and standard deviation. Chi-square test and Fisher exact test were used to find out the result by SPSS software. In this study p-value was also found.

RESULT

Twenty five patients were taken in this study, out of which 18(72%) were males and 7(28%) were females. The mean age of these patients was 49.56 years (age range 28-70 years) and mean \pm SD was 49.56 ± 10.3 years. Mean age of females and males was 45.6 years (age range 28-66 years) and 52.2 years (age range 35-70 years) respectively. Mean \pm SD in females and males was 45.6 ± 11.09 years and 52.2 ± 9.29 years respectively.

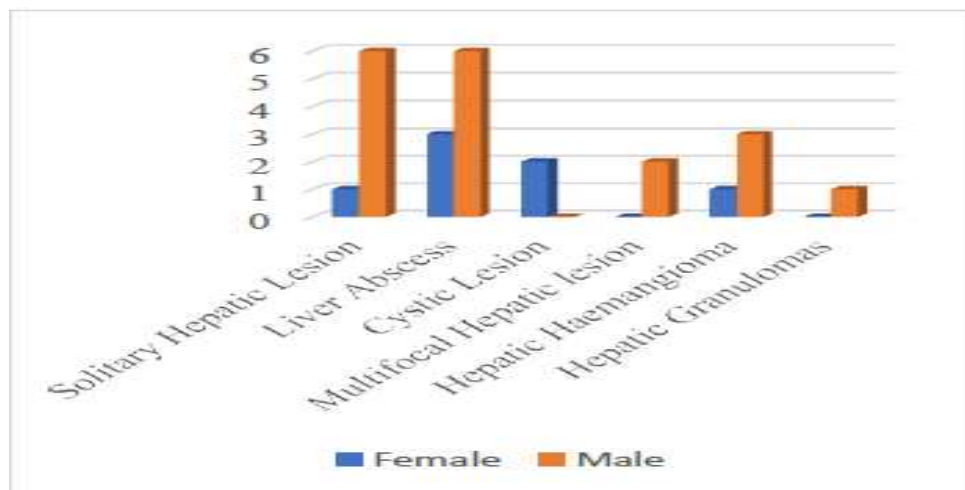


Graph 1.1- Shows ratio of gender

Largest finding was liver abscess in 9 (36%) patients. Second largest finding was solitary hepatic lesion in 7 (28%) patients. Least no. of finding was hepatic granulomas in 1(4%) patients. In females maximum no. of finding was liver abscess in 3(42.8%) patients and minimum no. of finding was solitary hepatic lesion and hepatic haemangioma in 1(14.2%) patients. Multifocal hepatic lesion and hepatic granulomas were not found in females. In males maximum no. of finding was liver abscess and solitary hepatic lesion in 6(33.3%) patients and minimum no. of finding was hepatic granulomas in 1(5.5%) patients. Cystic lesion was not found in males

Table.1.1 Shows pathology on the basis of gender

Final Diagnosis	Female	Male	Total
Solitary Hepatic Lesion	1(14.2%)	6(33.3%)	7(28%)
Liver Abscess	3(42.8%)	6(33.3%)	9(36%)
Cystic Lesion	2(28.5%)	0(0%)	2(8%)
Multifocal Hepatic lesion	0(0%)	2(11.1%)	2(8%)
Hepatic Haemangioma	1(14.2%)	3(16.6%)	4(16%)
Hepatic Granulomas	0(0%)	1(5.5%)	1(4%)

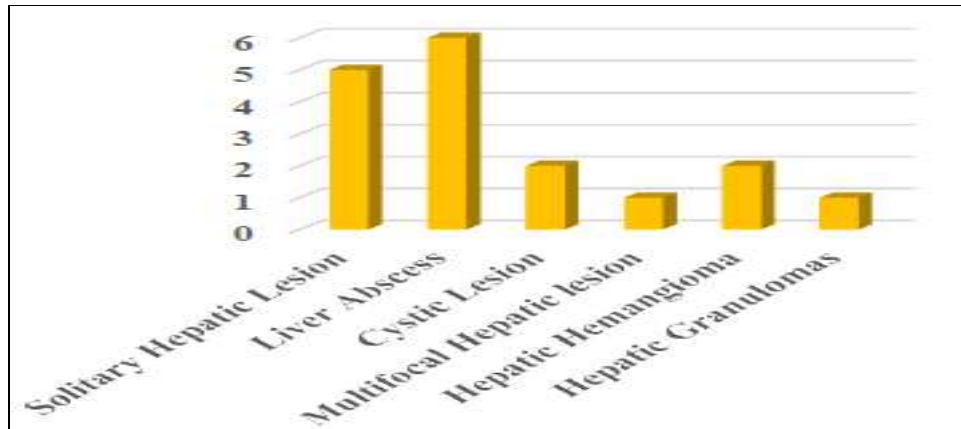


Graph 1.2 Distribution of pathology on the basis of gender

Total 17 patients underwent for triple phase CT. Out of which 6 (35.29%) patients had liver abscess, 5 (29.41%) patients had solitary hepatic lesion, 2 (11.76%) patients had cystic lesion and hepatic haemangioma and 1 (5.88%) patients had multifocal hepatic lesion and hepatic granulomas.

Table 1.2. Patients underwent for TPCT for particular pathology

Triple Phase CT Diagnosis	No. of Patients	Percentage
Solitary Hepatic Lesion	5	29.41%
Liver Abscess	6	35.29%
Cystic Lesion	2	11.76%
Multifocal Hepatic lesion	1	5.88%
Hepatic Haemangioma	2	11.76%
Hepatic Granulomas	1	5.88%

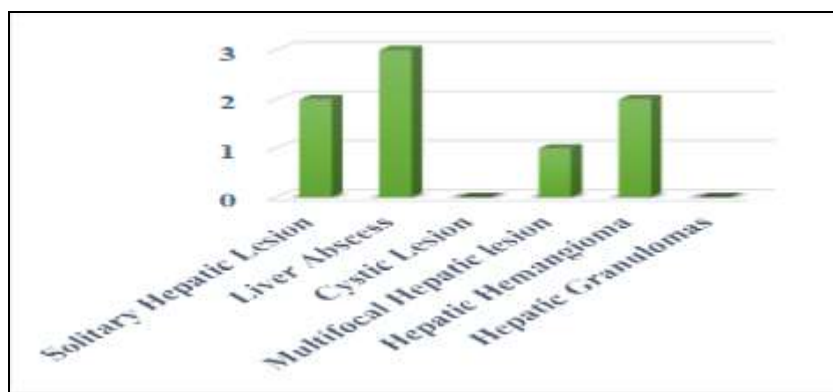


Graph 1.3. Patients underwent for TPCT for particular pathology

Total 8 patients underwent for ultrasound. Out of which 3 (37.5%) patients had liver abscess, 2 (25%) patients had solitary hepatic lesion and hepatic haemangioma, 1 (12.5%) patients had multifocal hepatic lesion, Cystic lesion and hepatic granulomas were not diagnosed in ultrasound.

Table 1.3 Patients underwent for ultrasound for particular pathology

USG Diagnosis	No. of Patients	Percentage
Solitary Hepatic Lesion	2	25.00%
Liver Abscess	3	37.50%
Cystic Lesion	0	0.00%
Multifocal Hepatic lesion	1	12.50%
Hepatic Haemangioma	2	25.00%
Hepatic Granulomas	0	0.00%



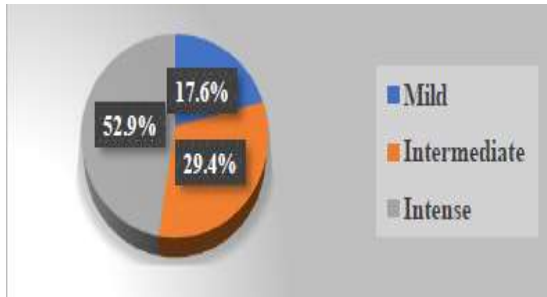
Graph 1.4 Patients underwent for ultrasound for particular pathology

The enhancement pattern of pathology in TPCT images were found as mild, intermediate and intense. Whereas, in the images of 3 (17.6%) patients the pathology was appeared of mild quality. In 5 (29.4%) patient's images pathology was appeared of intermediate quality. In the images of 9

(52.9%) patients pathology was of intense quality.

Table 1.4. Shows enhancement pattern in both male and female in TPCT images

Enhancement Pattern	Yes	Percentage
Mild	3	17.6%
Intermediate	5	29.4%
Intense	9	52.9%

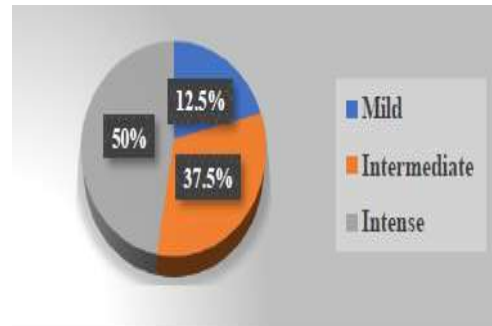


Graph 1.5 Shows enhancement pattern in both male and female in TPCT

The enhancement pattern of pathology in ultrasound images were mild, intermediate and intense in 1 (12.5%), 3 (37.5%), 4 (50%) patients respectively.

Table 1.5 Shows enhancement pattern in both male and female in USG images

Enhancement Pattern	Yes	Percentage
Mild	1	12.5%
Intermediate	3	37.5%
Intense	4	50%



Graph 1.6 Shows enhancement pattern in both male and female in USG images

Table 1.6 Patient underwent for TPCT and USG for particular pathology

Findings	Triple Phase CT Diagnosis	USG Diagnosis	p-value
Solitary Hepatic Lesion	5 (29.41%)	2 (25.00%)	0.663(NS)
Liver Abscess	6 (35.29%)	3 (37.50%)	0.823(NS)
Cystic Lesion	2 (11.76%)	0 (0.00%)	0.003**
Multifocal Hepatic lesion	1 (5.88%)	1 (12.50%)	0.258(NS)
Hepatic Haemangioma	2(11.76%)	2 (25.00%)	0.110(NS)
Hepatic Granulomas	1 (5.88%)	0 (0.00%)	0.015*

NS- Not Significant

* p-value is significant at the 0.05 level of significance.

** p-value is significant at the 0.01 level of significance.

Chi-square test and Fisher Exact test would be applied to compare the triple phase CT with USG Diagnosis

CT triple phase and USG diagnosis was correlated significantly using chi-square test and fisher exact test. Solitary hepatic lesions, liver abscess, multi focal hepatic lesions and hepatic haemangioma were not significantly correlated between the two modalities with p- value >0.05. Cystic lesion and Hepatic Granulomas were found significantly correlated between the two modalities with p- value <0.05.

DISCUSSION

CT triple phase has been accepted as one of the foremost and most efficient method of examinations of hepatic system like hemangioma etc and ultrasonography has been called the gatekeeper of the radiology department. Bajenaru N et al^[7]. reported that the frequency of hepatic hemangioma is higher among adults (in the age group of 30-50) and women are more susceptible

with 5:1 ratio of female to male cases with predominant location in segment 4 of right lobe liver. In Our study a total of 4 hemangioma cases were investigated which were in the range of age group stated by Bajenaru N et al. However, the majority of cases were reported in males (n=3) compared to female patients (n=1) which might be due to the small number of cases investigated in our study. Multi focal liver lesions were suspected as hepatic cellular carcinoma. Hyper vascular enhancement was shown on arterial phase and wash out was observed during the portal phase. Similar findings were also found in the study conducted by Lee K.H.Y et al ^[8]. Cystic lesions were present in two female patient and both the patients were in middle age group from 31-50 years. Both had well defined cystic lesion in liver. Similarly, in the study of Levy AD et al^[9]. cystic lesions were predominantly seen in middle aged females. A 50 year old female had a well defined left side renal cyst in IVa segment of liver and IVb segment of liver with mild peripheral enhancement. Two Patients were

identified with liver abscess which was located in the right lobe of the liver. Another two cases of liver abscess showed hypodense peripheral post contrast enhancement. Similarly, Halvorsen RA et al.^[10] reported that usually abscesses were distributed through the entire liver. However, right lobe was involved in majority of the cases. About 62% of the total cases of liver abscess were detected easily after contrast enhancement. Patel SK et al.^[2] reported that liver abscess cases were predominantly found more in males as compared to females. Our study also yielded similar results with 6 male liver abscess cases and 3 female cases. There were several limitations in this study firstly, it was a retrospective study that included a group of selected patients undergoing the same triphasic CT protocol. Sample size and number of cases were small in this study. Secondly, the correlation of CT triple phase and ultrasonography diagnosis in different space occupying lesions was not investigated in the same patient. However, samples were collected from different patients. This study focuses on the need for standardization of investigations for space occupying liver lesions. Thus, we recommend future studies to investigate different space occupying lesion cases in the same patient on both the modalities so that the true capability of the diagnosis by the two modalities will figure out.

CONCLUSION

Liver abscess was the most commonly reported space occupying lesion which was more commonly seen in males than in females. The sensitivity of liver triple phase was high as compare to the ultrasound which was mainly noticed in liver abscess. USG must be performed in all the patients with clinical suspected hepatic masses for initial detection and localization of lesion. Triple phase CT and ultrasonography can distinguish different types of space occupying lesions. The demonstration of enhancement patterns of different space occupying lesions is fundamental in

establishing the vascular nature of the lesions and thus helps in identification of different benign or malignant lesions. On correlation of both the modalities, it showed overall non- significant diagnostic capability with significant results only in two pathologies, which might be due to the small sample size included in the study. Therefore, we recommend further investigations on this study with a larger and vast sample size in order to get more promising outcomes.

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Conflict of Interest: The author has no conflict of interest.

Disclosure

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Ethical approval was obtained from all participants.

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