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Original Research Article

A comparative evaluation of focal hepatic lesions by ultrasonography and triple phase computed tomography

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Abstract

Background & Methods: The aim of the study is to compare evaluation of focal hepatic lesions by ultrasonography and triple phase computed tomography. The Study population includes all the patients with suspicion of hepatic masses on clinical and/or Ultrasonography findings.

Results: In the present study, we were observed following CT findings: Hemangioma (8.92 %), Hepatic adenoma (1.79%), Hepatic cyst (7.14%), Hydatid cyst (8.93%), Liver abscess (30.35%),focal nodular hyperplasia (1.79%), Hepatocellular carcinoma (30.35%), Hepatoblastoma (3.57%), Metastasis (3.57%) and Cholangiocarcinoma (3.57%).

Conclusion: Hydatid cysts and liver abscess have typical appearance on USG as well as CT, both the modalities having high sensitivity and specificity. Hence, cysts and abscess are diagnosed by one modality further investigation may not be needed. However, subsequent to treatment, for liver abscess follow up is easier with USG. In the case of metastasis, hemangiomas, HCC and cholangiocarcinoma, CT is superior to USG, as these lesions have specific enhancing patterns on triple phase study. CT can clearly identify nearby organs and display the precise extent of a localized lesion. As a result, while the specificity and sensitivity of both modalities are essentially similar, CT is marginally more accurate than USG in evaluating focal hepatic lesions. Ultrasound should be the first choice because it is widely available, cost effective, non-invasive and free from radiation. When ultrasound is not confirmatory help of CT scan may be performed in atypical cases to know the exact extent of the lesion prior to surgery. For follow up USG is the adequate modality in most situations.

Keywords: focal, hepatic, lesions, ultrasonography & tomography.
Study Design: Comparative Study.

1. INTRODUCTION

The liver is a crucial part of the digestive system, contributing significantly to the processing of carbohydrates, amino acids, and lipids, as well as the production of proteins[1]. It becomes prone to various diseases because of its major function of detoxification and rich blood supply by hepatic artery and portal vein[2,3]. The liver parenchyma typically gets 70% of its blood supply from the portal vein and 30% from the hepatic artery [4].

The basic pathophysiology of parenchymal hepatic diseases usually depicts an alteration in one of these metabolic pathways.Focal liver masses encompass a range of both malignant and benign neoplasms. In cross-sectional imaging, two basic issue relate to a mass lesion:

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characterization of known hepatic lesion (what is it?) and detection (is it there). Commonly encountered benign hepatic lesions includes hepatic cyst, bilioma, hepatic abscess, granuloma, focal nodular hyperplasia, hepatic adenoma, bile duct adenoma, angiomyolipoma, leiomyoma, mesenchymal hamartoma and hemangiomas [1].

Liver masses are a significant category of pathologies that affect the liver, and hepatic masses are among them. The identification of liver masses is increasing due to the widespread use of imaging modalities. For instance, X-rays, arteriography, radionuclide scanning, ultrasound and, after 1970s, computed tomography (CT) and magnetic resonance imaging (MRI)[5].

Most primary and metastatic liver tumors, receives their blood from the hepatic artery, thus reverses the normal proportion and hepatic artery becomes the prime source of blood supply. These difference in pattern of blood flow forms the basic of triple phase scan of liver [6]. The above method has been useful in clarifying the visual characteristics of both primary and metastatic liver tumors.

The triphasic spiral computed tomography technique enables the visualization of the entire liver in three phases, starting from the moment the contrast is administered. The first phase is the hepatic arterial phase, which enables early identification of primary malignancy of the liver (hepatocellular carcinoma) and benign lesions (such as hemangioma, focal nodular hyperplasia and hepatocellular adenoma). The portal venous phase, which is the second phase, is the most effective phase for detecting certain hypervascular tumors (like hepatocellular carcinoma, metastatic melanoma, etc.) and most hypovascular liver tumors such as metastatic lung carcinoma, metastatic colon cancer, and metastatic breast cancer. The third phase, also known as the hepatic venous phase or the delayed/equilibrium phase, in combination with the hepatic arterial phase, provides information about the vascularity of the lesion, which can further aid in clarifying the nature of the lesion.

2. MATERIAL AND METHODS

Present study was conducted in the Department of Radiodiagnosis and Imaging, Gwalior. on 56 patients. Simple random sampling procedure was used. Patients were selected from the attendance list of each particular day. Patients were given appointment dates depending on their convenience. 17.8% of simple cyst using Triphasis Computed Tomography. In evaluation of hepatic lesion from study of takikonda et.al. 2021 at 95% confidence and 10 % anticipated absolute difference.

Inclusion Criteria-

- The study includes, Patients with suspicion of hepatic lesions on clinical and/or Ultrasonography findings.
- Cases of all age groups irrespective of sex.

Exclusion criteria

- Patients with renal disease
- Patients who are at risk for allergic reactions to contrast.
- Pregnant patients.
- Claustrophobic patients.

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3. RESULT

Table 1: Age Group Distribution

Age group		
	Frequency	**Percent**
1-10	**3**	**5.36**
11-20	**1**	**1.79**
21-30	**4**	**7.14**
31-40	**10**	**17.86**
41-50	**11**	**19.64**
51-60	**18**	**32.14**
>60	**9**	**16.07**
Total	**56**	**100.0**

In the present study, age group were categorised into seven groups as followings: 1-10 years (5.36%), 11-20 years (1.79%), 21-30 years (7.14%), 31-40 years (17.86%), 41-50 years (19.64%, 51-60 years (32.14%) and >60 years (16.07%). Most common age group was 51-60 years whereas least common age group was 11-20 years.

Table 2: Number of lesions

Number of lesions		
	Frequency	**Percent**
Single	54	96.42
Multiple	2	3.57
Total	56	100.0

Out of 56 patients, 3.57% had multiple lesions whereas 96.42% had single lesion observed during the study.

Table 3: USG DIAGNOSIS

USG DIAGNOSIS		
	Frequency	**Percent**
HEMANGIOMA	5	8.93
HEPATIC MASS	7	12.5
HEPATOCELLULAR CARCINOMA	10	17.85
CHOLANGIOCARCINOMA	2	3.57
ADENOMA	1	1.78
FOCALNODULAR HYPERPLASIA	1	1.78
HEPATOBLASTOMA	2	3.57
LIVER ABSCESS	17	30.35
HEPATIC CYST	4	7.14
HYDATID CYST	5	8.92
METASTASIS	2	3.57
Total	56	100.0

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In the present study, we were observed following types of USG findings among hepatic lesion affected patients: Haemangioma (8.93%), Hepatic Mass (12.5%), hepatocellular carcinoma (17.85%), cholangiocarcinoma (3.57%), hepatic adenoma (1.78%), focal nodular hyperplasia (1.78%), hepatoblastoma (3.57%), Abscess (30.35%), Hepatic Cyst (7.14%), HYDATID CYST (8.93%) and Metastasis (3.57%).

Table 4: Arterial Phase

ARTERIAL PHASE		
	Frequency	**Percent**
Heterogenous Enhancement	22	39.28
Homogenous enhancement	1	1.78
Enhancing wall	17	30.35
Enhancing Peripherally	2	3.57
Peripheral Nodular Enhancement	5	8.92
Non Enhancing	9	16.07
Total	56	100.0

In the present study, we were observed following arterial findings: Heterogenous Enhancement (39.28%), Homogenous Enhancement (1.78%), Enhancing wall (30.35%), Enhancing Peripherally (3.57%), Peripheral Nodular Enhancement (8.92%) and Non Enhancing (16.07%).

Table 5: TPCT Findings

TPCT Findings		
	Frequency	**Percent**
Hemangioma	5	8.92
Hepatic adenoma	1	1.78
Hepatic cyst	4	7.14
Hydatid cyst	5	8.92
Liver Abscess	17	30.35
Focal nodular hyperplasia	1	1.79
Hepatocellular carcinoma	17	30.35
Hepatoblastoma	2	3.57
Metastasis	2	3.57
Cholangiocarcinoma	2	3.57
Total	56	100.0

In the present study, we were observed following CT findings: Hemangioma (8.92 %), Hepatic adenoma (1.79%), Hepatic cyst (7.14%), Hydatid cyst (8.93%), Liver abscess (30.35%),focal nodular hyperplasia (1.79%), Hepatocellular carcinoma (30.35%), Hepatoblastoma (3.57%), Metastasis (3.57%) and Cholangiocarcinoma (3.57%).

4. DISCUSSION

On Triple phase CT total 17 cases (30.35%) were correctly diagnosed to be HCC. All lesionsapperas heterodense (35.71%) on plain CT, showed early heterogenous enhancement (39.28%) in arterial phase with rapid washout (33.92%) in portovenous phase. 10 lesions had

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capsular enhancement in delayed phase (58.82%) and 15 cases had portal vein thrombosis (68.1%).

Overall accuracy of USG in diagnosing HCC was found out to be 93.3 % and 100% on TPCT study with significant P value of <0.01. These shows a good correlation between both modalities.

Tanaka H et al [(7)] also agreed that, USG is important not only for surveillance but also characterization of hepatocellular carcinoma (HCC).

Progressed HCCs receive their blood supply from unpaired arteries rather than portal veins and venous drainage occurs through the portal veins rather than the hepatic veins according to Fournier LS et al [(8)].

Hennedige T et al [(9)] found that using triple-phase CT or double arterial-phase CT (including early and late arterial phases) could enhance sensitivity in detecting HCC, potentially reducing the occurrence of false-positive findings compared to using any single phase alone. Ultrasonography (USG) and triple- phase computed tomography (CT) are both important imaging modalities used in the diagnosis, evaluation, and management of hepatocellular carcinoma (HCC).

According to Leoni S et al [(10)], the diagnosis of HCC is mainly based on the qualitative or visual appreciation of differences in attenuation on CT, echogenicity on CEUS and signal intensities on MRI of the HCC with respect to surrounding liver parenchyma. Accurate imaging diagnosis of HCC requires access to state-of-the-art CT and MRI equipment along with skilled interpretation. USG is valuable for initial screening and guidance for interventions in HCC, while triple-phase CT offers detailed imaging crucial for diagnosis, staging, and comprehensive evaluation of hepatocellular carcinoma. Together, they provide a robust approach to the management of HCC.

In present study there were total 17 cases (30.35%) of liver abscesses out of which 9 were males (58.92%) and 8 were females (47.05%). A total of 17 cases (30.35%) of liver abscesses were correctly diagnosed on USG, and all of them were confirmed on CT scan. On USG, lesions appears heteroechoic or hypoechoic and some of them showing internal septations within it. On TPCT the lesions appeared to be hypodense and on contrast administration wall enhancement was seen with central hypodense core of the abscess in all the phases.

Mohsen AH et al [(11)], also said that UltraSonography and CT are the more common imaging modalities to image the liver for possible abscesses. Although sonography is usually the first choice of imaging for hepatic abscesses, CT has a 97% sensitivity while sonography has a 85% sensitivity for diagnosing liver abscesses.

Khim G et al [(12)], also said that Imaging techniques, such as ultrasonography and computed tomography (CT) scanning, are useful tools to demonstrate a space occupying lesion and confirm presence or absence of a liver abscess. Both ultrasonography (USG) and triple-phase computed tomography (CT) are essential imaging modalities for the diagnosis and management of liver abscesses, each with its strengths and specific uses in clinical practice.

5. CONCLUSION

Hydatid cysts and liver abscess have typical appearance on USG as well as CT, both the modalities having high sensitivity and specificity. Hence, cysts and abscess are diagnosed by one modality further investigation may not be needed. However, subsequent to treatment, for liver abscess follow up is easier with USG. In the case of metastasis, hemangiomas, HCC and cholangiocarcinoma, CT is superior to USG, as these lesions have specific enhancing patterns on triple phase study. CT can clearly identify nearby organs and display the precise extent of

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a localized lesion. As a result, while the specificity and sensitivity of both modalities are essentially similar, CT is marginally more accurate than USG in evaluating focal hepatic lesions. Ultrasound should be the first choice because it is widely available, cost effective, non-invasive and free from radiation. When ultrasound is not confirmatory help of CT scan may be performed in atypical cases to know the exact extent of the lesion prior to surgery. For follow up USG is the adequate modality in most situations.

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