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Original Article

Evaluation of Focal Hepatic Lesion and Associated changes in Gallbladder and Kidneys using Spiral Computed Tomography

Ayesha Faazal[1], Sadia Sana[1*], Abu Huraira[1], Noor Fatima[1], Somara Sana[2] and Zafaar Siddique[2,3]

[1]College of Allied Health Professionals, Government College University Faisalabad, Pakistan

[2]Saleema Siddique Maternity Home Kalar Khar Chowk, Chakwal, Pakistan

[3]University Institute of Radiological Sciences & Medical Imaging Technology, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan

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***Corresponding Author:**

Sadia Sana

College of Allied Health Professionals, Government College University Faisalabad, Pakistan

sadiasana203@gmail.com

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ABSTRACT

Focal hepatic lesions are the lesions in the liver apart from its usual parenchyma**. Objective:** To check the efficiency of triphasic computed tomography for diagnosing benign and malignant focal liver lesions and to assess frequencies of both types of liver lesions. **Methods**: On 60 patients, triphasic CT scan for the liver was performed in Allied Hospital, Faisalabad. The liver was scanned in the arterial, the portal-venous, and the delayed phases followed by contrast injection. During all of these phases evaluation of lesions was made on enhancement patterns and frequencies of each lesion was checked. **Results**: The results showed that out of 60 patients 26(43.3%) were diagnosed with benign and 34(56.67%) were diagnosed with malignant focal liver lesions. Benign cases had a higher frequency of Haemangioma and malignant cases had a higher frequency of hepatocellular carcinoma. The overall study showed the percentage of incidents in gallbladder and renal system. **Conclusions**: The triphasic CT liver due to its accuracy provides assured diagnosis for liver lesions and thus reduces biopsy procedures.

INTRODUCTION

Focal hepatic lesions are the lesions in the liver apart from its usual parenchyma which are under variable sizes and may or may not affect the normal hepatobiliary system's structure and function [1,2]. Most of the focal liver lesions are solitary and only 20% are multiple lesions. With the advancement in radiography, characterization of the lesion has become easier without having histopathological examinations [3]. Across geographic regions and ethnic groups, the prevalence of lesions category is different. In a wide spectrum of benign focal lesions cysts, hepatocellular adenomas, Haemangioma, and focal nodular hyperplasia are the most prevalent. Through the United States and Europe, focal liver lesions are almost metastatic deposits than primary malignancy. In Pakistan, prevalence of hepatocellular carcinoma is 8–10% and is the fourth most common type of hepatic disorder [4]. Chronic liver disorder (CLD) becomes the cause of primary malignancy like hepatocellular carcinoma [5-8]. Primary and metastatic liver tumors mostly receive blood through the hepatic artery, hence the usual proportion of liver blood supply overturns that is mainly given through the portal vein to the hepatic artery that turns out to be a prime blood supply source [12]. HCC depending upon benign or malignant, if not treated on time can lead to severe damage to related organs i.e., spleen, pancreas, colon, gallbladder or renal system. It can prevalence cancer cells to that organs or

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cause infection due to viruses or bacteria mostly due to HCC pancreas, gallbladder, and kidneys are more affected. In our study, we will discuss the changes that occur in GB and the kidney due to HCC under the CT imaging modality [13,14].

METHODS

This study was carried through the Radiology department of Allied hospital, Faisalabad, Pakistan and included a total of 60 cases. Patients, irrespective of gender and age were considered for this study. Patients with a history of renal failure, pregnancy, and allergic reactions to contrast medium were excluded. On a Performa; gender, age, and lesion characterizations by CT were noted. CT scan was performed to evaluate Hepatocellular Carcinoma and HCC related changes in the gallbladder and renal system and expert opinion was taken in each case about modality. For triphasic CT scanning of liver, GE Scanner machine of 128 slices were used, with 120kVP, 500mAs, and 400 collimations and focal liver lesions were observed. IV Omnipaque / Ultravist contrast dose was given by 1.5ml/kg with 4ml/s speed. After 35-40 seconds, images were taken at the arterial phase. The portal phase was then observed after 65-80 seconds. In the delayed phase, the images were seen after 8-10 min. In each phase, enhancement patterns of each lesion were evaluated and according to enhancement patterns, lesions were recorded as the hypo, hyper, iso, and mixed enhancement. The region of interest was selected at the liver, aorta, as well as at portal vein during the procedure. Images were reconstructed with 5-7 mm thickness. By the triphasic CT scan's findings, benign and malignant lesions were classified. Hepatic cysts, a benign-like lesion, appeared hypodense and the arterial, portal venous, and equilibrium phases had no enhancement. In the case of Haemangioma, enhancement in the peripheral region of the arterial phase and centripetal filling of the contrast in portal-venous and then in equilibrium phase was noted. For the focal nodular hyperplasia and the hepatic adenoma, hyperenhancement on arterial, the mixed and mixed patterns at portal-venous, and equilibrium phases were shown. In the case of hepatomas, hyperenhancement, iso or mixed enhancement, and iso or mixed enhancing patterns in the arterial, portal-venous, and then equilibrium phases respectively, were observed. On the arterial phase, the hyper vascular metastasis seems hyper-enhancing with a mixed pattern on portal-venous and equilibrium phases. Though the hypo-vascular metastatic condition on arterial phase seems hypo enhancing portal-venous phase however showed maximum enhancement. For diagnosis, the history and the clinical presentation were studied by consultant radiologists.

RESULTS

The technique of triple-phase CT is perfect in support of diagnosing benign conditions like hemangioma. With its arterial, late arterial, and portal-venous phases it is a leading procedure for diagnosis as well as for characterization of hepatocellular carcinoma. During a triphasic CT scan of patients, 60 of them were diagnosed with focal liver lesions. The age group was ranged between 45 to 85 years. Maximum patients were between the ages of 52 to 68 years. Out of these 60 patients, 39(65.0%) were males and 21(35.0%) were females (Table 1).

Gender	Number of patients	Percentage (n=100)
Male	39	65
Female	21	35
Total	60	100

Table 1: Gender-wise distribution of patients

Figure 2 shows that 26(43.3.0%) patients had benign focal liver lesions and 24 (56.67.0%) had malignant focal liver lesions.

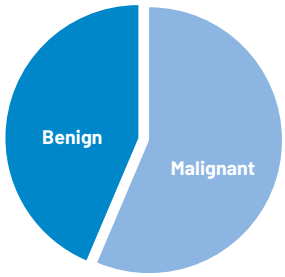

Figure 2: Percentage of benign and malignant liver lesions

Patients had a history of hepatitis in 44 (73.3%), liver cirrhosis in 21(35.0%), and colorectal cancer in 10 (16.67%). Some patients were asymptomatic others included symptoms of abdominal pain in 42 (70.0%), fever in 14 (23.3%), nausea and vomiting in 18 (30.0%), and weight loss in 12 (20.0%). In our study 26 (43.3%) benign focal liver lesions and 34 (56.67%) malignant focal liver lesions were documented. Of the total, 34 malignant focal lesions, 24 (70.6%) were diagnosed with HCC and 10 (29.4%) with metastasis. The malignant focal lesion HCC is at number five, being major common cancer, and is at number 3 being the major common reason of cancer-associated deaths in the world. Under research, about 80% of HCC cases are because of chronic infection of hepatitis B or C. Out of 24 (70.6%) HCC cases in our study 18 (75%) were males and 6 (25%) cases were among females (Table 2).

Total patients=60	Parameter	Frequency(%)
Sex	Males	39(65.0%)
	Females	21(35.0%)
History	Hepatitis B/C	44(73.3%)
	Liver cirrhosis	21(35.0%)
	Colorectal cancer	10(16.67%)

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Present history	Abdominal pain	42(70.0%)
	Nausea and vomiting	18(30.0%)
	Fever	14(23.3%)
	Weight loss	12(20.0%)
Lesion location	Right lobe	37(61.67%)
	Left lobe	10(16.67%)
	Both lobes	13(21.67%)
Number of lesions	Single	31(51.67%)
	Multiple	29(48.33%)
Type of lesion	Benign	26(43.3%)
	Malignant	34(56.67%)
Characterization	HCC	24(40%)
	Metastasis	10
	Hemangioma	9
	Cyst	6
	Focal fatty infiltration	4
	Abscess	3
	Polycystic liver disease	2
	FNH	2

Table 2: Distribution of gender, history, lesion location, numbers of lesions, and final categorization of the lesion

Figure 3 showed that from a total of 24 HCC patients, 10 (29.4%) were metastasis cases, 5 (50%) cases in males, and 5 (50%) cases in females were reported. From total 26 (43.3%) benign focal lesions, 9 (34.6%) were Haemangioma, 6 (23.1%) were cysts, 4 (15.4%) were focal fatty infiltration, 3 (11.5%) were abscess, 2 (7.7%) were polycystic lesions and 2 (7.7%) were FNH. Benign focal liver lesions are mostly asymptomatic and diagnosed by chance at the time of other imaging analyses. Beyond the age of 40 simple hepatic cysts are usual findings.

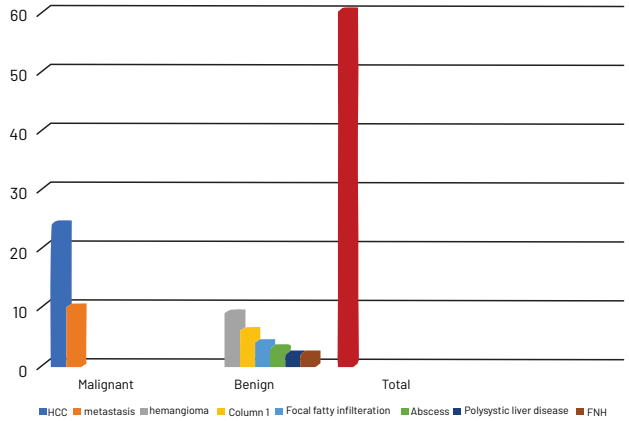

Figure 3: Total number of benign and malignant liver lesions taken from a study population

In HCC patients, gallbladder changes were also seen in CT findings like gallbladder visualization, calculus (35.9%), cyst, Cholecystitis (34.8%), and normal or gallbladder wall thickness (Table 3).

Serial No.	Parameters	Percentage
1.	GBL visualization	94.6%
2.	Calculus	35.9%
3.	Cholelithiasis	34.8%
4.	Normal gallbladder wall thickness	83.7%

Table 3: Gallbladder changes with HCC

Table 4 showed density patches appearance on both kidneys either hyper or hypo dense according to their frequencies, like in 05 patients hypo dense and in 02 patients' hyper dense tissues appear in the right kidney, and in 08 patients hypo dense and in 0 patient's hyper dense tissues appear in left kidney. And 15 patients are which shows the density changes in both kidneys and 30 patients shows no density changes in kidneys with HCC as observed in Table 4.

CT Findings	No. of patients with presence
Right kidney hypo dense	05
Right kidney hyper dense	02
Left kidney hyper dense	08
Left kidney hypo dense	0
Density changes in Both	15
Density changes in None	30

Table 4: Density Appearance in kidneys with HCC

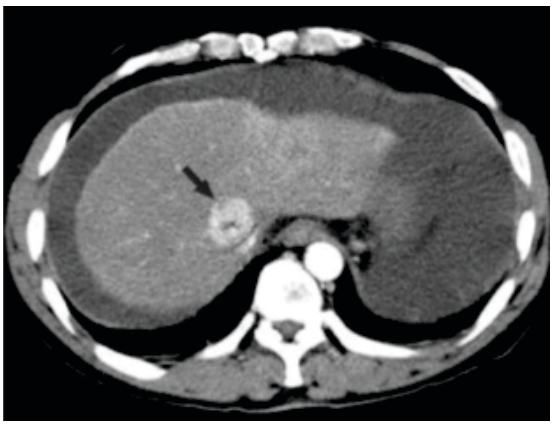

Figure 4: HCC at arterial phase

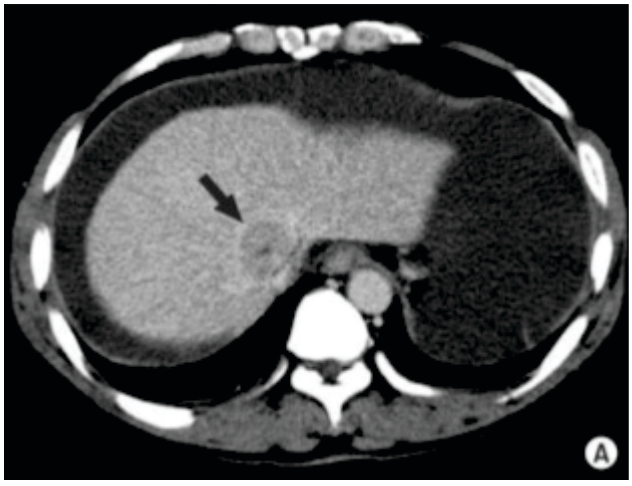

Figure 5: HCC at the early washout

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DISCUSSION

In our study, all of the benign lesions appear homogeneous, whereas each of the 24 hepatocellular carcinomas appears as mixed or hyper-density lesions. Only one lesion was better visualized on portal-venous phase images, but 23 HCC were identified using only arterial phase images. At the arterial phase, all hyper or mixed density liver lesions in patients with underlying chronic liver disease represent hepatocellular carcinomas. Therefore, the lesions visualized at the arterial phase imaging may need a biopsy for further evaluation. Recognition and evaluation for the small lesion of HCC are more significant, as these small liver lesions as compared to large lesions have more chances of removal through surgery. The arterial phase imaging proved useful for the recognition of the hyper vascular lesions and it is crucial in case of characterization of a high proportion of lesions. According to two different studies, hepatocellular carcinoma in comparison to the surrounding liver parenchyma displays characteristic enhancement during the arterial phase imaging, in the portal venous phase imaging shows washout of the contrast material, and in the delayed phase, imaging appears hypodense. With liver cirrhosis, the enhancement pattern is taken as hepatocellular carcinoma. But few HCC lesions do not track this pattern of enhancement as some of HCCs do not show the washout of contrast material on the portal-venous and delayed phase imaging. Although, washout is seen on all other benign and malignant lesions [15,16]. In another study, the simple liver cyst was having a ratio of 4:1 between female and male patients, respectively [17]. In a study conducted in 2011, hepatocellular carcinoma and metastasis being hyper-vascular have a higher arterial blood supply ratio and may be seen merely on hepatic arterial phase imaging. On arterial phase images, metastatic liver lesions with hyper vascularity were seen more accurately than on the portal-venous phase imaging. Hepatocellular carcinoma shows enhancement on the arterial phase images and thus gives the best visualization during the arterial phase imaging [18,19]. For the routine liver assessment and for aiding in the declination in the mortality and the morbidity rates for the patients who have liver diseases, triphasic computed tomography has achieved approval being the ideal CT procedure [20,21]. Through triphasic CT, following injection of contrast media, data acquisition of complete liver at different intervals becomes fast. As a result, triphasic computed tomography of the liver is a standardized technique to detect and characterize enormous types of focal liver lesions including benign and malignant [22,23].

CONCLUSIONS

Through the triphasic CT scan of the liver the frequency and category of benign as well as malignant focal lesion can be evaluated, which lowers the invasive biopsy procedures. Also concluded that the CT abdomen for HCC patients also evaluates the gallbladder and kidney changes which occur secondary due to primary liver cancer, but the occurrence of these changes is rare. HCC commonly affects gallbladder and renal function.

Conflicts of Interest

The authors declare no conflict of interest.

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