Study of Liver Lesions using Computed Tomography

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Abstract: This study aimed to study the role of computed tomography (CT) in the diagnosis of liver lesions, to determine which lesion of the liver with high incidence, and to find out the Geographic distribution of the liver lesions in Sudan. This is a retrospective study was conducted at Fedail hospital, and Royal scan Center, Khartoum, Sudan included Sixty patients with focal liver lesions. The results of the study revealed that the high incidence of liver lesions was (45%) among the age group between (41-60) years old. The high incidence of liver lesions was metastasis (33.3%) and solid mass (33.3%) affected age group (41-60) years old (45%), it commonest in male (60%), most patients from center, north, and west of Sudan**.** The solid mass of the liver was commonest in age group (61-80) years old had an incidence of (45%), it commonest in male (65 and the most affected was right lobe of the liver (50%). This study concluded that triphasic CT scan is a good non-invasive tool and can be used as the first line for differentiating of focal liver lesions. Benign lesions like haemangioma can be reliably differentiated from malignant liver lesion; therefore unnecessary biopsies can be avoided.

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1. Introduction

Focal liver lesions can be defined as any lesion in the liver other than the typical parenchyma and can be of unpredictable size. These lesions can be benign or malignant. Prevalence of various liver lesions has marked differences across geographic regions and ethnic groups. [1]

Various pathologies that afflict the liver, liver masses form an important group. Hepatic masses are increasingly being identified due to the widespread use of imaging modalities. These include X-rays, arteriography, radionuclide scanning, ultrasound and, since the 1970s, computed tomography (CT) and magnetic resonance imaging (MRI).[2]

Liver lesions are not visible in a conventional radiograph unless calcified. Ultrasonogram (USG) is most often used as the initial mode of investigation to assess liver lesions. However, often the definitive diagnosis is not based on gray-scale information alone and a mass detected on ultrasound is generally evaluated further with contrast-enhanced CT (CECT) or MRI for definitive characterization.[3] .

Focal nodular hyperplasia and adenomas may appear hyperdense during the hepatic arterial phase and may rapidly become isodense to the liver or invisible during the portal venous phase and equilibrium phase, simulating hepatomas or hypervascular metastases. [4]

Although current literature search shows that MRI has a comparable rate in detection and classification of focal liver lesions, however, rapid availability and short scanning time made CT an ideal imaging technique.[5-7] various studies have also reported an improvement in lesion detection if arterial phase imaging is performed in addition to portal venous imaging especially in the presence of hypervascular neoplasms, such as hepatocellular carcinoma.[8-10]

Recent studies have reported an improvement in lesion detection if arterial phase imaging is performed in addition to portal venous imaging, especially in the presence of hypervascular neoplasms, such as hepatocellular carcinoma (HCC).[11,12]

The liver lesions have increased significantly in the last few years and still represent major health problem, with difficulty in diagnosis and invasive biopsy test, this study aimed to study the role of CT in diagnosis of the liver lesions, determine which lesion in the liver with high incidence and to find out the Geographic distribution of the liver lesions .

2. Material and Methods

This is a retrospective study was conducted at Fedail, and Royal scan center, Khartoum, Sudan.

Subjects

This study included 60 patients who referred for liver CT scan.

Inclusion criteria

a) All ages and genders.

b) Contrast-enhanced abdominal CT.

c) Patients with innumerable lesions in both liver lobes.

Exclusion criteria

a) Inappropriate contrast medium injection (for example contrast medium extravasation).

b) Patients with contraindication for iodinated contrast medium c) Incomplete images.

d) Images with artifacts (for example respiratory artifacts) which would make density measurements inaccurate or unreliable.

Study variables

A clinical sheet filled for each patient's age, residence, the computed tomography appearance for lesions with different shapes, sizes and contents and the suggested diagnosis.

Machine used

Multi detectors computed tomography with the automatic injector for contrast media, and they are Toshiba, GE, and Siemens.

Technique used

The entire liver scanned successively; in arterial, portal and equilibrium phases. A 5mm collimation and 5mm/sec table speed used. All scans were taken in the craniocaudal direction and during a single breath hold. After obtaining a digital scout view, the unenhanced scan of the liver was obtained.100-200 Ml of 65% iodinated contrast material will be given by using a power injector at a rate of 1.5 to 2ml/sec. After 22 or 27seconds, the entire liver was scanned in arterial phase.22 seconds after the end of the arterial phase; the liver was scanned in portal venous phase. The 20 second can delays for the patient to breath and reposition the scan plane cephalad to the liver. After these two phases, the third scan was taken in the equilibrium phase, 8-10 minutes after injection of contrast the images acquired in different phases were evaluated in detail to identify lesions.

Data Analysis

The results were picked up about the incidental findings. And with different figures, graphs, and groups it explained the role of computed tomography to detect the liver lesions.

Ethical consideration

The data collected from the patients and it kept secret, and it recorded as it collected from the patients, all this data collected according to the patient satisfaction and agreement.

3. Results

The results of this study presented in figures and tables as the following :

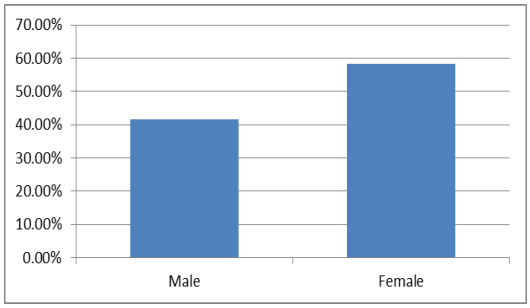

Figure 1. Gender distribution

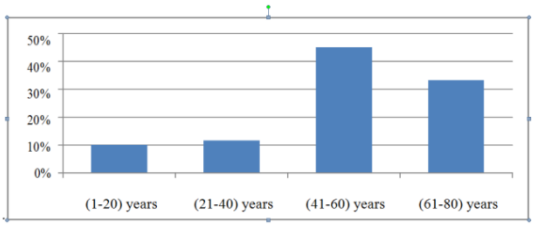

Figure 2. Age distribution

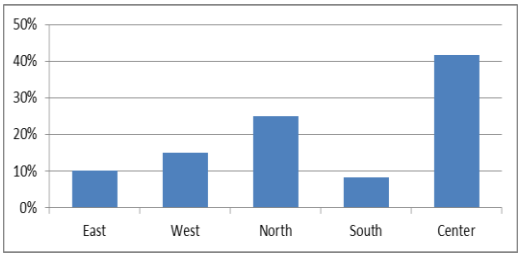

Figure 3. Distribution of residence

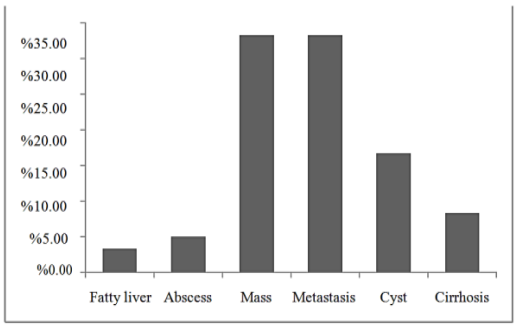

Figure 4 CT findings (liver lesions)

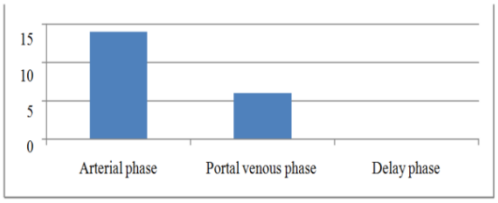

Figure 5. Distribution of the appearance of Metastasis in Phase of Acquisition

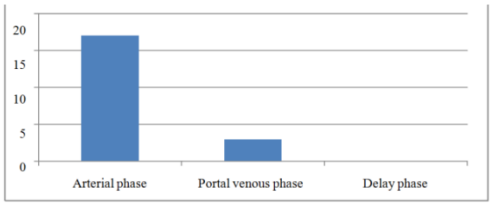

Figure 6. Distribution of the appearance of in Mass Phase of Acquisition

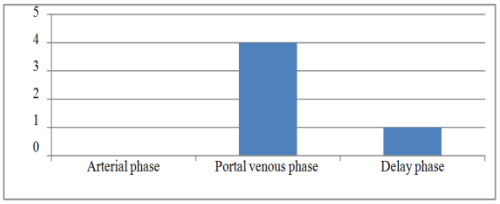

Figure 8. Distribution of the appearance of Cirrhosis in Phase of Acquisition

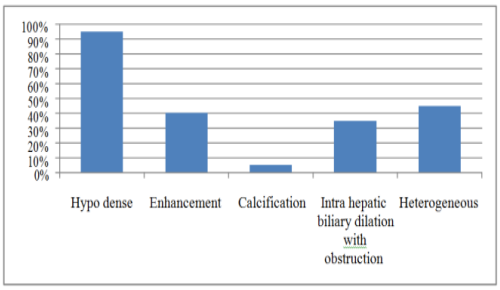

Figure 7. Distribution of the appearance of the solid mass

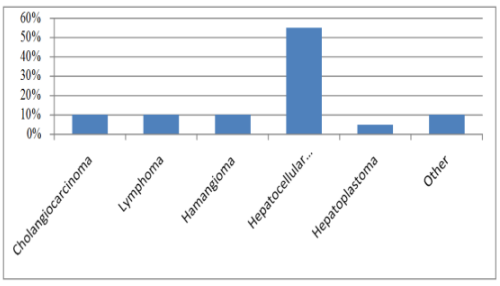

Figure 9. Distribution of the probability of the solid mass in the liver

Table 1: Characteristic Features of Detected Hepatic Lesions on CT

Pattern of Enhancement	The phase of Acquisition with maximum lesion conspicuity	No of Cases	Suggested Diagnosis
The attenuation of the liver is at least 10 HU less than that of the spleen or if the attenuation of the liver is less than 40 HU	Non-enhanced	2	Fatty liver
	Portal venous phase		
	Delay phase		
Multifocal lesions with arterial phase enhancement and portal venous phase washout of contrast	Arterial phase	14	Metastasis
	Portal venous phase	6	
	Delay phase		
Multiple lesions with thick wall and central necrosis nor daughter cyst	Arterial phase		Abscess
	Portal venous phase	2	
	Delay phase	1	
Single lesion with sharp margins and near water density in the center and does not show enhancement in the center	Arterial phase		Cyst
	Portal venous phase	6	
	Delay phase	4	
Single heterogeneous lesion with hyperdense component	Arterial phase	17	Mass
	Portal venous phase	3	
	Delay phase		
Multiple regenerative nodules are isodense to rest of liver with lobar atrophy	Arterial phase		Cirrhosis
	Portal venous phase	4	
	Delay phase	1	

4. Discussions

Triphasic spiral liver Computed Tomography (CT) is a standardized procedure for the detection of a large variety of liver lesions. [13,14] Also fast data acquisition allows successive scanning of the entire liver at different intervals after injection of the iodinated contrast material, thus creating the possibility of multiphase liver computed tomography. [15, 16]

This study included (60) patients (58.3%) of them were female **(**Figure 1), the high incidence of liver lesions was (45%) in age group between (41-60) years old **(**Figure 2), the most patients from center, north, and west of Sudan **(**Figure 3**).**

The results of this study showed that (3) cases were liver abscess, 10 cases were liver cysts, 20 cases were liver masses, 20 cases were liver metastases, 5

cases was liver cirrhosis and (2) case was fatty liver **(**Figure 4) and table(1).

Most metastatic lesions were hypovascular with more lesions being detected on portal venous phase and most of the primary malignancies were hypervascular and detected on hepatic arterial phase **(**Figure 5). However, haemangiomas, focal nodular hyperplasia, and hepatocellular adenoma are benign lesions which are seen to enhance in the arterial or hypervascular phase. In our study, 14 metastatic lesions were hypervascular, and six lesions were hypovascular, Most of the hypervascular metastatic lesions (n =20) were best visualized on arterial phase images rather than on port venous phase **(**Figure 6). Most of them become iso or hypodense on portovenous and equilibrium phases making it difficult to diagnose on single phase thus signifying the importance of additional arterial phase images **(**Figure 7). [17]

Advanced or poorly differentiated hepatocellular carcinomas are usually hypervascular lesions. Similarly, cirrhosis and its associated altered portal venous blood flow may help reveal more lesions on the hepatic arterial phase than on the portal venous phase **(**Figure 8). In our study, all the 60 hepatomas presented as hyper/mixed; 31 detected only in the arterial phase; 21 were hypo attenuating in the portal phase, and eight were better seen in portal phase. of HCC. All hyper/mixed/mixed lesions occurring in patients with chronic liver disease truly represent HCC lesions **(**Figure 9). [18,19] Therefore; lesions seen during only the hepatic arterial phase may require biopsy. In patients with hypervascular malignancies such as hepatoma, detection of small lesions especially if solitary is important because these lesions are more likely to be respectable or respond to therapy than the larger lesions. [20, 21]

Conclusion

This study concluded that triphasic CT scan is a good non-invasive tool and can be used as the first line for differentiating of focal liver lesions. Benign lesions like haemangioma can be reliably differentiated from malignant liver lesion; therefore unnecessary biopsies can be avoided.

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