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Original Article

Role of Computed Tomography in the Evaluation of Focal Liver Lesions

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ABSTRACT

The liver lesions have marked differences across geographic regions and ethnic groups. In order to avoid inappropriate diagnosis and unnecessary surgery, Computed Tomography (CT) being a non-invasive imaging modality and with high sensitivity, provides better detection and distinguishing benign from malignant focal liver tumor lesions. **Objective:** To determine the role of Computed Tomography in the evaluation of focal liver lesions. **Methods:** A descriptive study was conducted at Government Kot Khawaja Saeed Teaching Hospital, Lahore, Pakistan. A sample size of 124 patients of both genders, age ranging from 22-90 years were enrolled in this study with a convenient sampling technique. Pregnant females and patients having renal insufficiency were excluded. The variables used to obtain data were: Age, Gender, Presenting complex clinical risk factors, CT findings, and other diagnoses. Toshiba Aquilion 16 CT scanner with KV 80-135 and MAs 500 was used. Injections of 1.5ml/kg IV contrast were given to patients, with a total dosage of 80-100ml at 4.5ml/sec through an 18G intravenous catheter. After contrast injection liver was scanned at 3 different time points or phases. All of the factors mentioned above were documented and kept in each patient's individual case record form (CRF). Data was gathered during the time frame specified. To examine the acquired data and arrange and compile the results, the statistical tool SPSS version 24 was used. Descriptive statistics and a *Chi-square* test was applied to check the comparison. **Results:** Among 124 individuals, 77(62.1%) individuals were males, and 47 (37.9%) individuals were female. Average age of patients was 53.85±13.50 years. Multiple lesions were observed in 79 (63.7%) individuals had multiple lesions while 45 (36.3%) individuals had a single lesion. 94 (75.8%) individuals had malignant lesions while 30 (24.2%) had benign lesions. Lesions were more common in males than in females. The most common presenting complex clinic risk factor was hepatitis C virus with 45 individuals (36.3%) with Hepatitis C +ve. The most common CT finding was Hepatocellular Carcinoma with 41(33.1%). **Conclusions:** The study concluded that Computed Tomography being a non-invasive imaging modality and with high sensitivity, provides better detection and differentiation between benign and malignant focal liver lesions.

INTRODUCTION

For gastroenterologists and hepatologists, focal liver lesions (FLLs) are a common reason for consultation. Solid or cystic masses or regions of tissue recognized as an aberrant component of the liver are known as FLLs [1]. Patients with cirrhosis of the liver or colorectal cancer are more likely to have them recognized, but accidental liver lesions are becoming increasingly common. FLLs were discovered in up to 33% of radiological tests, according to certain reports. It exceeded 50% in autopsy cases [2]. The liver is unique in that it receives blood from two sources: the portal vein (70–80%) and the hepatic artery (20–30%). Any drop in portal blood flow is compensated by an increase in arterial blood flow since these two arteries link at different levels. In the presence of chronic hepatic venous system abnormalities, portal vein resistance increases, resulting in an increase in hepatic arterial flow. Hepatic artery flow is likely to play a role in the progression of liver lesions [3]. Hepatic hemangioma, focal nodular hyperplasia (FNH), benign liver cyst, and focal fat sparing are examples of benign lesions that do not require

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treatment; second, benign lesions that do require treatment include hepatic adenoma, adenomatosis, biliary cystadenoma, hepatic abscess, echinococcal cyst, granulomatous inflammation, and inflammatory pseudo-tumor. Third, Hepatocellular carcinoma (HCC), cholangiocarcinoma, liver metastases from various original sites, biliary cystadenocarcinoma, hepatic angiosarcoma, and lymphoma are examples of malignant mass lesions for which treatment is always required if possible [4]. The prevalence of various liver lesions has marked differences across geographic regions and ethnic groups. In Europe and the United States, a focal liver lesion is more likely to be a metastatic deposit than a primary malignancy; nonetheless, hepatocellular carcinoma is the fourth most prevalent hepatic condition in Pakistan, with a prevalence of 8-10% [5]. Hemangioma has the highest prevalence at 1.4%, followed by FNH (0.4-3%) and adenoma (0.003%). Simple hepatic cysts are common, ranging from 0.1 to 2.5%, but imaging detection improves with age. Women account for 96% of cystadenomas and 66% of cystadenocarcinomas in the biliary system (1% of cystic liver lesions)[6]. It is critical to distinguish between benign and malignant localized liver lesions in individuals in order to avoid unneeded diagnosis and surgery or chemotherapy [7]. In many circumstances, ultrasonography is the first imaging modality used to test for localized liver lesions. However, as it is difficult to distinguish between benign and malignant lesions in many circumstances, conventional sonography's sensitivity remains low (between 55-70%) compared to other modalities like CT or magnetic resonance imaging (MRI). Despite the fact that histopathology is the gold standard, a biopsy is never an option due to its intrusive nature [8,9]. A standardized imaging technique for the detection and characterization of a wide range of benign and malignant liver lesions is triphasic CT) The introduction of contrast agents, which allows the description of precise vascular patterns regardless of tissue specificity, contributes to the improved accuracy observed with CT and MRI [10,11]. The best times to image the liver with triphasic CT scan are during the late-arterial phase (35 seconds after contrast injection) when hyper-vascular liver lesions tend to have the most enhancement relative to background liver, the portal venous phase (60–70 seconds), when hypo-vascular liver metastases and portal veins are best visualized, and the delayed (or equilibrium) phase (3–5 minutes), when washout or contrast retention can be best characterized. The non-enhanced phase is used to provide limited additional diagnostic information for liver lesions while also lowering the radiation exposure [12,13]. CT, as a non-invasive imaging modality with a higher sensitivity than other imaging modalities, allows for improved detection and discrimination between benign and malignant localized liver lesions, avoiding unneeded diagnosis and surgery [14]. With the aid of CT scan, this study will aid in the diagnosis of localized liver lesions.

METHODS

In Government Kot Khawaja Saeed Teaching Hospital, Lahore, Pakistan, a descriptive study was conducted. 124 patients of ages ranging from 22-90 years were enrolled in this study with a convenient sampling technique. Patients of both genders above 18years came to the radiology department of Govt. Kot Khawaja Saeed Teaching Hospital for CT abdomen. The variables used to obtain data were: age, gender, presenting complex clinical risk factors, CT findings, and other diagnoses. Toshiba Aquilion 16 CT scanner with KV 80-135 and MAs 500 was used. Injections of 1.5ml/kg IV contrast were given to patients, with a total dosage of 80-100ml at 4.5ml/sec through an 18G intravenous catheter. After contrast injection liver was scanned at 3 different time points or phases. All of the factors mentioned above were documented and kept in each patient's individual case record form (CRF). The data was gathered during the time frame specified. To examine the acquired data and arrange and compile the results, the statistical tool SPSS version 2.4 was utilized. Descriptive statistics and a Chi-square test was applied to check the comparison

RESULTS

On CT findings, the diseases found were Calcified cyst, Cholangio Carcinoma, CLD, HCC, Hepatic cyst, Hepatic Hemangioma, Hepatic lesion, Hepatic mass, Hepatic nodule, Hepatocellular Adenoma, Hepatomegaly, Hydatid cyst, Liver Abscess, Lymphadenopathy, METS, Multifocal Hepatoma, Multifocal lesions, Neoplastic mass, Nodular hepatic texture with frequency 1(0.8%), 1(.8%),6(4.8%), 41(33.1%),1(.8%),9(7.3%),10(8.1%),1(.8%) ,10(8.1%), 2(1.6%), 1(.8%),(1.6%),2(1.6%),3(2,4%),2(1.6%),16(12.9%),4(3.2%),11(8 .9%),1(.8%),1(.8%),respectively.The most common CT finding was Hepatocellular Carcinoma(Table 1).

Vartiable	Frequency	Percent
Calcified cyst	1	.8
Cholangio Carcinoma	1	.8
CLD	6	4.8
HCC	41	33.1
Hepatic cyst	9	7.3
Hepatic Hemangioma	10	8.1
Hepatic lesion	1	.8
Hepatic mass	10	8.1
Hepatic module	2	1.6
Hepatocellular Adenoma	1	.8

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Vartiable	Frequency	Percent
Hepatocellular Adenoma	2	1.6
Hepatomegaly	2	1.6
Hydatid cyst	3	2.4
Liver Abscess	2	1.6
Lymphadenopathy	16	12.9
METS	4	3.2
Multifocal lesions	11	8.9
Neoplastic mass	1	.8
Nodular hepatic texture	1	.8
Total	124	100.0

Table 1: Descriptive Statistics of CT Findings

Out of 124 individuals, 79 (63.7%) individuals were hepatitis C+ve while 45 (36.3%) individuals were normal. 47 (37.9%) females were hepatitis C+ve while 77(62.1%) males were normal. Among them, 14 (11.3%) females were hepatitis C+ve while 33 (26.6%) were normal. 31 (25%) males were hepatitis C+ve while 46(37.1%)males were normal(Table 2).

			hepatitis C+ (Y/N)		Total
			Yes	No	
Gender	Male	Count	33	14	47
		% of Total	26.6%	11.3%	37.9%
	Female	Count	46	31	77
		% of Total	37.1%	25.0%	62.1%
Total		Count	79	45	124
		% of Total	63.7%	36.3%	100.0%

Table 2: Cross-Tabulation between Gender and Hepatitis C

Out of 124 individuals, 79 (63.7%) individuals had multiple lesions while 45 (36.3%) individuals had a single lesion. 47 (37.9%) females had focal liver lesions while 77 (62.1%) males had focal liver lesions. Among them, 24 (19.4%) females had multiple lesions while 23 (18.5%) had a single lesion. 55 (44.4%) males had multiple lesions while 22 (17.7%)males had a single lesion(Table 3).

			Number of lesions (Single/Multiple)		Total
			Multiple	Single	
Gender	Male	Count	24	23	47
		% of Total	19.4%	18.5%	37.9%
	Female	Count	55	22	77
		% of Total	44.4%	1707%	62.1%
Total		Count	79	45	124
		% of Total	63.7%	36.3%	100.0%

Table 3: Cross-Tabulation between Gender and Number of Lesions

Out of 124 individuals, 94(75.8%) individuals had malignant lesions while 30(24.2%) individuals had a benign lesion. In 47 (37.9%) females 30 (24.2%) females had malignant lesions while 17(13.7%)had benign lesion while in 77(62.1%) males, 64 (51.6%) males had malignant lesions while 13 (10.5%)males had benign lesion(Table 4).

			Type of lesion (Benign/Malignant)		Total
			Benign	Malignant	
Gender	Male	Count	17	30	47
		% of Total	13.7%	24.2%	37.9%
	Female	Count	13	64	77
		% of Total	10.5%	51.6%	62.1%
Total		Count	30	94	124
		% of Total	24.2%	75.8%	100.0%

Table 4: Cross-Tabulation between Gender and Lesion Types

Out of 124 individuals, 39(31.5%)females had splenomegaly while 8 (6.5%) females were normal. 62 (50%) males had splenomegaly while 15(12.1%)males were normal(Table 5).

			Splenomegaly		Total
			Yes	No	
Gender	Male	Count	8	39	47
		% of Total	6.5%	31.5%	37.9%
	Female	Count	15	62	77
		% of Total	12.1%	50.0%	62.1%
Total		Count	23	101	124
		% of Total	18.5%	81.5%	100.0%

Table 5: Cross-Tabulation between Gender and Splenomegaly

Out of 124 individuals, 79 (63.7%) individuals had multiple lesions while 45(36.3%) individuals had a single lesion. In the age group 22-42 years, 14 (11.3%) individuals had multiple lesions while 12 (9.7%) individuals had single lesion, in age group 43-62 years, 47 (37.9%) individuals had multiple lesions while 23(18.5%) individuals had single lesion, in age group 63-82 years 16 (12.9%) individuals had multiple lesions while 9(7.3%) individuals had single lesion, and in age group 83-93 years, 2 (1.6%) individuals had multiple lesions while 1(0.8%)individuals had a single lesion (Table 6).

			Hwpatitis C+(Y/N)		Total
			Yes	No	
Age Group	22-42	Count	16	10	26
		% of Total	12.9%	8.1%	21.0%
	43-62	Count	42	28	70
		% of Total	33.9%	22.6%	56.5%
	63-82	Count	20	5	25
		% of Total	16.1%	4.0%	20.2%
	83-92	Count	1	2	3
		% of Total	0.8%	1.6%	2.4%
Total		Count	79	45	124
		% of Total	63.7%	36.3%	100.0%

Table 6: Cross-Tabulation between Age and Hepatitis C

DISCUSSION

The participants in our research ranged in age from 22-90 years old. Patients aged 43-62 years old were the most common, accounting for 70 (56.5%) of the total. The age range 83-92 years had the lowest number of patients, with only 3 (2.4%) cases. Within the range studied for 22–90

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years, the mean age 53.85±13.50. This mean age finding was consistent with other studies. In the study done by Ahirwar et al., also showed peak incidence in 41-50 age group with 30 patients whereas the peak incidence in our study was observed in 43-62 age group. Similarly, an investigation done by Rathore et al. showed that the age group 41-50 years (25.71%) had the highest number of patients, while the age group 81–90 years had the lowest number(1.42%)[15].

Figure1: The study demonstrates arterial phase enhancement shows focal hepatic lesions on CT

Figure 2: CT showed Cirrhotic liver with irregular margins, well defined hypodense lesion that shows in segment VII appearance likely HCC

In our study on CT findings, the diseases found were AHCC (0.8%), Cholangio Carcinoma (0.8%), Cirrhosis (1.6%), CLD (3.2%), HCC (33.1%), Hepatic Abscess (.8%), Hepatic cyst(7.3%), Hepatic Hemangioma (8.1%), Hepatic lesion (0.8%), Hepatic mass (8.1%), Hepaticnodule (1.6%), Hepatocellular Adenoma (0.8%), Hepatomegaly (1.6%), Hydatid cyst(1.6%), Liver Abscess(1.6%), Lymphadenopathy(1.6%), METS (12.9%), Multifocal Hepatoma (83.2%), Multifocal lesions (8.9%), Neoplastic mass (0.8%), Nodular hepatic texture (0.8%). A study conducted by Tyagi V, et al., showed Hepatocellular carcinoma (20%), Metastasis (33.3%), Hydatid cyst (2%), Abscess (5%), Hemangioma (13.3%), Gallbladder carcinoma, Cholangio-carcinoma and other (5% each) and simple liver cysts (10%) in CT diagnosis. Our study documented 94 (75.8%) malignant lesions while 30 (24.2%) had benign lesions. Out of them, 41 (33.1%) were hepatocellular carcinoma and 16 (12.9%) were metastatic lesions. These results showed HCC to be the most common malignant lesion with a percentage of 33.1% and our results are similar to the study conducted in 2019 by Ominde ST and Mutala TM, found HCC to be the most common malignant lesion at 44.2% [16]. In this study, 44 (86.3%) were diagnosed to be malignant and seven (13.7%) were benign. Later pathological examination revealed that 43 (84.3%) of the lesions were malignant and 8 (15.7%) were benign. A total of 124 patients' data was gathered, with 77 men and 47 females. Our study showed male predominance and there are many studies that also showed similar male predominance. A study done by Hasan et al., showed that out of 40 patients, liver lesions were seen in 26 males and 14 females, indicating a male preponderance. In another study done by Anaye et al., comprised of 63 female and 82 male patients with an average age of 59 and 65 years, respectively [17]. One study conducted by Boas FE et al., showed triple phase CT scan to be 89% sensitive and 97% specific in diagnosing HCC [18]. In another study, the sensitivity of triphasic CT scan in the HCC diagnosis was 78% with a specificity of 73% which was conducted by Alkholy MA et al. [19]. Leeuwen et al., study says that as it allows for image acquisition during maximal enhancement of the liver parenchyma during a single breath-hold, spiral CT is the ideal CT method for routine liver examination. They also came to the conclusion that quick data acquisition allowed for successive scanning of the complete liver at different times following contrast administration, allowing for multiphasic hepatic CT [20].

CONCLUSION

Our study concluded that Computed Tomography being a non-invasive imaging modality and with high sensitivity, provides better detection and differentiation between benign and malignant focal liver lesions. The percentage of HCC in males is more than in females.

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