

# Role of Computerized Tomographic Findings in Cases of Focal Hepatic Lesions

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## Abstract

**Introduction:** Focal Hepatic Lesions (FHL) has been a common reason for consultation faced by medical consultants. With the widespread use of imaging studies led to an increase in detection of incidental focal liver lesions. It is important to consider both malignant liver lesions as well as benign solid and cystic liver lesions such as hemangioma, focal nodular hyperplasia, hepatocellular adenoma, and hepatic cysts, in the differential diagnosis. **Objectives:** Our aim was to study the computerized tomographic finding in the various focal hepatic lesions and also to study the various enhancement pattern of the focal hepatic lesion. **Materials and Methods:** CT scan study of abdomen and pelvis was done on 100 patients from August 2015 to December 2017 over a period of the 2 years. Patients, irrespective of age and sex referred to radiology department of our institute on IPD or OPD basis were included in the study. All patients will be subjected to computerized tomography of the abdomen with CT (Siemens Somatom Emotion 6) machine and Somatom Essenza. **Results:** Total 100 patients were studied for various focal hepatic lesions out of which 64(64%) were male patients and 36(36%) were female patients. The most common affected age group encountered in our study was 51-60 years. Various focal hepatic lesions were reported in which 64(64%) patient had malignant nature of lesion with most common pathology detected was hepatic metastasis seen in 37(37%) patient. On other hand benign lesion were evident in the 36(36%) patient with hemangioma as most common pathology in this category. **Conclusion:** Multi-detector Computed Tomography (MDCT) with a correlation of triple phase study is an excellent tool for diagnosis of the focal liver lesion by learning the degree and pattern of enhancement in all three phase thus helping in better characterization of the lesion. MDCT allows the reconstruction and reformation of images supported in detecting multiple lesions and early diagnosis of a focal lesion in the presence diffuse liver condition.

**Keyword:** Benign, Computerized Tomography, Hepatic, Lesion, Malignant, Tumour

## 1. Introduction

Focal Hepatic Lesions (FHL) has been a common reason for consultation faced by medical consultants. With the widespread use of imaging studies led to an increase in detection of incidental focal liver lesions. It is important to consider both malignant liver lesions as well as benign solid and cystic liver lesions such as hemangioma, focal

nodular hyperplasia, hepatocellular adenoma, and hepatic cysts, in the differential diagnosis. Focal liver lesions are solid or cystic masses or areas of tissue that are recognized as an abnormal part of the liver. The term “lesion” rather than “mass” was chosen because “lesion” is a term that has a wider application involving solid and cystic masses<sup>1</sup>.

Many different techniques are available for imaging the liver. They include the long-established traditional

simple X-rays, Ultrasound, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). Recently introduced, Multi-detector CT is an excellent investigating technique for diagnosing all liver pathologies<sup>2</sup>.

## 2. Aims and Objectives:

To study the computerized tomographic finding in the various focal hepatic lesions and also to study the various enhancement pattern of the focal hepatic lesion.

## 3. Materials and Methods

CT scan study of abdomen and pelvis was done on 100 patients from August 2015 to December 2017 over a period of the 2 years. Patients, irrespective of age and sex referred to radiology department of our institute on IPD or OPD basis were included in the study. All patients were subjected to computerized tomography of the abdomen with CT (Siemens Somatom Emotion 6) machine and Somatom Essenza. All scans were taken in the craniocaudally direction and during single breath holding hold. After obtaining digital scout view, an unenhanced scan of the liver was obtained. A non-ionic, water-soluble contrast was given using power injector. After that entire liver was scanned in arterial phase. After the end of the arterial phase, the liver was scanned in venous phase. After these two phases, the third scan was taken in delayed phase after injection of contrast. The image acquired in different phase was evaluated to identify the lesion.

## 4. Results

### 4.1 Age Distribution

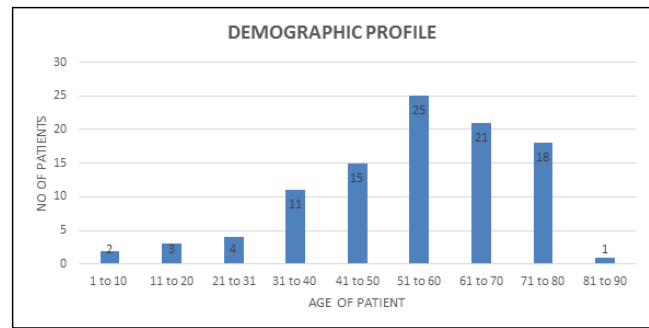
In 100 patients, age ranged from 1 year to 90 years of age. The youngest patient was 1 year old child and oldest patient was 84 year. The mean age of the patient was 55.08. Majority of the patient was found in the age group from 51 to 60 years which compromised of 25(25.0%) patient. The focal hepatic lesion was least observed in the 80 to 90 years just having one patient (Table 1 & Chart 1).

### 4.2 Sex Distribution

In the study of 100 patient majorities of the focal hepatic lesion was found in male which compromised of 64(65.0%) patient and female about 36(35.0%) (Table 2 & Chart 2).

**Table 1.** Demographic profile

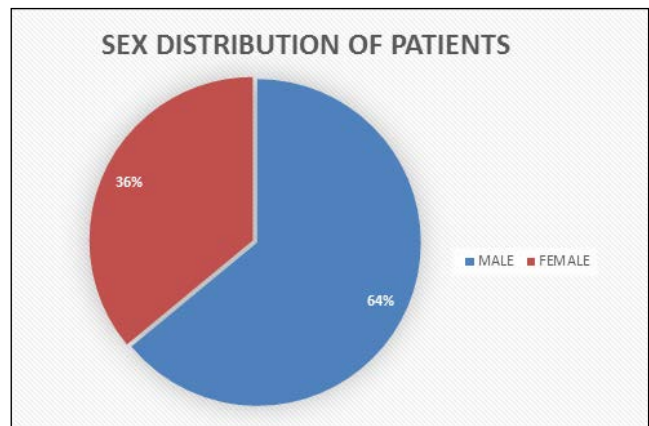
Age	No. of Patients	Percentage
1-10	2	2
11-20	3	3
21-30	4	4
31-40	11	11
41-50	15	15
51-60	25	25
61-70	21	21
71-80	18	18
81-90	1	1
<b>Total</b>	<b>100</b>	<b>100</b>



**Chart 1.** Demographic profile chart.

**Table 2.** Sex distribution profile

Sex of Patient	No. of Patient	Percentage
Male	64	64.0
Female	36	36.0



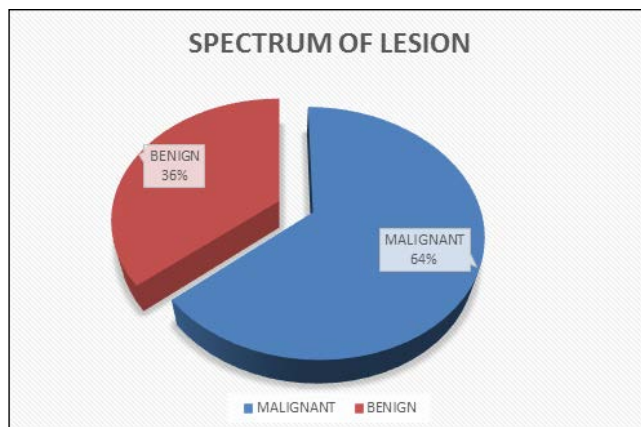
**Chart 2.** Sex distribution chart.

### 4.3 Spectrum of Focal Hepatic Lesion

In the present study, 64 patients were categorized under malignant lesion and 34 patients were benign. The malignant lesion includes hepatocellular carcinoma, metastasis, intrahepatic cholangiocarcinoma and hepatoblastoma where benign lesion includes hemangioma, hepatic abscess, hydatid cyst, hematoma, hepatic adenoma and hepatic cyst and mesenchymal hamartoma (Table 3 & Chart 3).

**Table 3.** Spectrum of focal hepatic lesion

Spectrum	No. of Cases	Percentage
Malignant	64	64.0%
Benign	36	36.0 %
<b>Total</b>	<b>100</b>	<b>100</b>



**Chart 3.** Spectrum of focal hepatic lesion.

### 4.4 Diseases Spectrum of Focal Hepatic Lesion

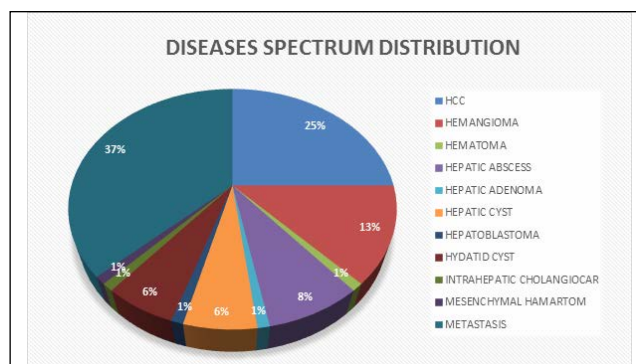
In our study focal hepatic lesion were found in 100 patient out of which most common pathology detected was Metastasis, seen in 37(37%) patient followed by hepatocellular carcinoma seen in 25(25%) patient, 13(13%) cases of hemangioma, 8(8%) cases of hepatic abscess, 6(6%) cases of hydatid cyst, 6(6%) cases of hepatic abscess and one patient each of intrahepatic cholangiocarcinoma, mesenchymal hamartoma, hepatic adenoma, hepatoblastoma and hematoma (Table 4 & Chart 4).

### 4.5 Number of Focal Hepatic Lesion

In a total of 100 focal hepatic lesions were detected by MDCT in our study, out of which 57(57%) lesion were solitary and 43(43%) lesions were multiple (i.e. more than one lesion). The most of multiple lesion was seen in the

**Table 4.** Diseases spectrum distribution table

Types of Etiology	No. of Cases	Percentage
Hepatocellular Carcinoma	25	25.0%
Metastasis	37	37.0%
Hemangioma	13	13.0%
Hepatic Abscess	8	8.0%
Hydatid Cyst	6	6.0%
Hepatic Cyst	6	6.0%
Intrahepatic Cholangiocarcinoma	1	1.0%
Hepatoblastoma	1	1.0%
Hepatic Adenoma	1	1.0%
Mesenchymal Hamartoma	1	1.0%
Hematoma	1	1.0%
<b>Total</b>	<b>100</b>	<b>100</b>

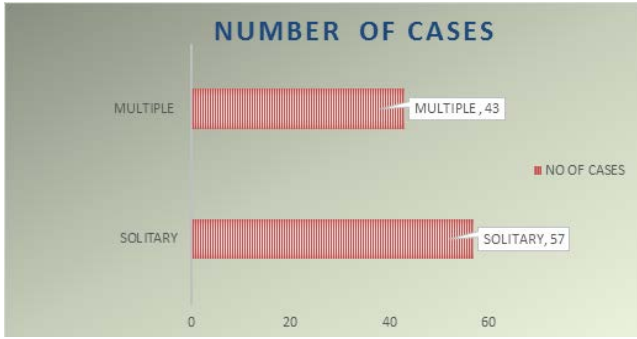


**Chart 4.** Diseases spectrum distribution chart.

metastasis and solitary lesion seen in HCC (Table 5 & Chart 5).

**Table 5.** Number of focal hepatic lesions

Lesions	No. of Cases	Percentage
Solitary	57	57.0%
Multiple	43	43.0%
<b>Total</b>	<b>100</b>	<b>100</b>



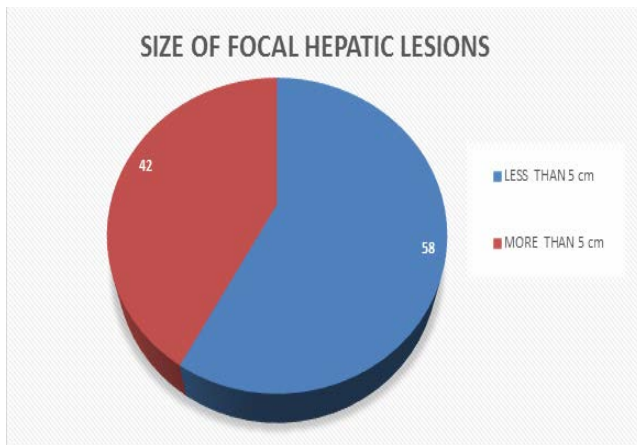
**Chart 5.** Number of lesion chart.

### 4.6 Size of Focal Hepatic Lesion

Among the studies of 100 focal hepatic lesions the maximum of the lesion had more than 5 cm associated with 58(58%) patient. Less than 5 cm lesions were seen in 42(42%) patient. However, some patient with metastasis showed both more and less than 5 cm sized lesion (Table 6 & Chart 6).

**Table 6.** Size of the focal hepatic lesions

Lesions	No. of Cases	Percentage
Less Than 5 Cm	58	58.0%
More Than 5 Cm	42	42.0%
<b>Total</b>	<b>100</b>	<b>100</b>



**Chart 6.** Size of the focal hepatic lesions.

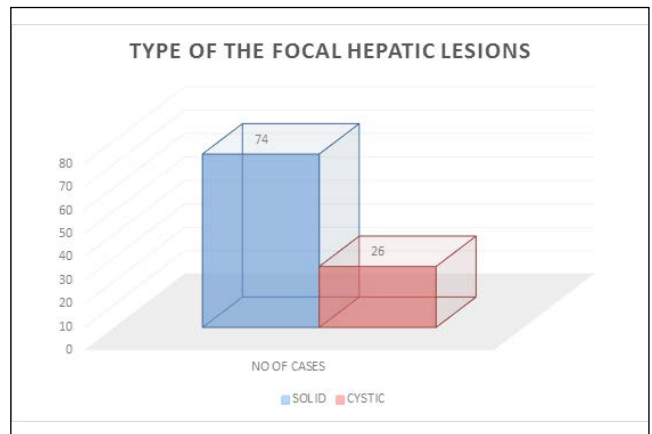
### 4.7 Types of Focal Hepatic Lesion

Majority of the focal hepatic lesion had solid lesion seen in 74(74%) patient and cystic lesion seen in 26(26%) patient. The solid lesions mostly include hepatocellular carcinoma, metastasis, hemangioma whereas cystic lesions include hepatic abscess, hydatid cyst, and hepatic

cyst. However, few metastasis may have central cystic component (Table 7 & Chart 7).

**Table 7.** Type of the focal hepatic lesions

Lesions	No. of Cases	Percentage
Solid	74	74.0%
Cystic	26	26.0%
<b>Total</b>	<b>100</b>	<b>100</b>



**Chart 7.** Type of the focal hepatic lesions.

### 4.8 Lobar Involvement of Focal Hepatic Lesion

Out of 100 patients 44(44%) patient's lesion was located in both lobes of the liver, right lobe of the liver was involved in 19(19%) patient and left lobe was involved in 37(37%) patient (Table 8).

**Table 8.** Lobar distribution of focal hepatic lesion

Lobe	No. of Cases	Percentage
Both	44	44.0%
Right	37	19.0%
Left	19	37 %
<b>Total</b>	<b>100</b>	<b>100</b>

## 5. Discussion

In our study MDCT scan was performed in 100 cases of the focal hepatic lesion. CT features of all focal hepatic lesion were studied. All imaging was done with help of Seimens Essenza machine in the Department of Radiodiagnosis of

Medical College and Tertiary center.

### 5.1 Age Distribution

In our study, the age group ranged from 1-90 years. The dominant age group was between 51-60 years having a total of 25 patients. The least number of patients were seen between age group 81-90 years. Within the range studied for 1-90 years, the mean age group was 55.07)

This mean age finding was consistent with a study done by the Leeuwan *et al.*<sup>3</sup> which also showed the mean age of 55.

In the study done by Ahirwar *et al.*<sup>4</sup> also showed 22(22%) patients fall under 51-60 age group which overlapped with 25 patient (25%) patients in our study. However, the peak incidence in our studies was observed in the age group 51-60 years whereas he showed peak incidence in 41-50 age group with 30(30%) patients.

Similar peak incidence in age group between 51-60 years correlating to our study was mentioned in study of Rathore *et al.*<sup>5</sup>

In the study of the Elbarbary *et al.*<sup>6</sup> showed the peak incidence in 50-60 age group with 20(50%) patients, followed by the 61-70 age group having 12(30%) patients. Thus, coinciding with the conclusion drawn from our study.

The above comparative study shows focal hepatic lesion to be more common in the middle age and older age group as compared to pediatric age group.

### 5.2 Sex Distribution

In our study of 100 patients, male predominance was found with 64(64%) patients whereas female patients contributed to 36(36%).

The studies that also showed similar male predominance are:

The study was done by Hafeez *et al.*<sup>7</sup> on 60 patients also showed 41(68.3 %) male patients and 19(31.6%) female patients.

Another study done by Hasan *et al.*<sup>8</sup> showed focal hepatic lesion in 26(65%) male patients and 14(36%) female patients out of 40 patients.

A similar study by Anaye *et al.*<sup>9</sup> done on 145 patients with the focal hepatic lesion, male predominance was seen with 82(56.1%) patients. The above-mentioned studies replicate well with our study.

However, the study done by the Geol *et al.*<sup>10</sup> differed from our study in which female predominance was seen.

Out of 38 patients, there were 23(60.5%) female patients and 15(39.5%) male patients.

### 5.3 Lobar Distribution

In our study, a maximum number of lesions were distributed in both lobes of the liver accounting to 44(44%) patients, followed by the right lobe with 37(37%) patients and least site of focal hepatic lesion was seen in left lobe with 19(19%) patients. The study done by the Rathore *et al.*<sup>5</sup> showed 30(42.85%) patients having right lobe involvement, whereas 28(40%) patients with both lobes involvement. Left lobe involvement was the least in his study, thus correlating with our study.

Lobar distribution similar to our study was also found by Nijalingappa *et al.*<sup>11</sup> which demonstrated 15(50%) patients having both lobe involvement, 13(43%) patient with right lobe involvement and 2(6.7%) patient with the left lobe.

### 5.4 Numbers of Lesions

In the study of 100 focal hepatic lesions we had 57(57%) patient who had a solitary lesion and 43 (43%) patients had multiple lesion scattered in the liver. However, on the contrary, Nijalingappa *et al.* study demonstrated evidence of multiple lesions (76.6%) more as compared to solitary lesion.

### 5.5 Size of the Lesion

Among the study of 100 patients, 58(58%) patients had to lesion less than 5 cm in size and 42(42%) patients had lesion more than 5 cm. The maximum cases contributed to hepatocellular carcinoma having lesion more than 5 cm and range from 2-15 cm with a mean size of 5.4 cm. These findings were identical with the study done by Matilde *et al.*<sup>12</sup> who evaluated 31 patients with HCC and found the mean size to be 5.2 cm and size range of 1-14.3 cm. The metastatic lesion size range from 1-10 cm with a mean size of 4.4 cm which also correlated with Matilde *et al.*<sup>12</sup> who studied 53 cases of hepatic metastases and found the mean size to be 4.9 cm and a size range of 1-16.5 cm.

The 4 patients of hemangioma had a size greater than 5 cm. Using a size criterion of 5 cm we categorized hemangioma larger than 5 cm in size as a giant hemangioma. Based on this criterion there were 4 cases of giant hemangioma which accounted for 30% of our cases. According to Adam *et al.*<sup>13</sup> study group, who considered >4 cm size criteria for giant hemangioma.



## 5.6 Diseases Spectrum

In total 100 focal hepatic lesions, the lesions were group into two categories, malignant and benign. 64(64%) patients had lesions malignant in nature and 36(36%) patients had lesions benign in nature. There were many studies which correlated with our study having the majority of cases malignant lesion.

The study done by Ahirwar *et al.*<sup>4</sup> show 60 malignant patients and 40 benign patients which correlated with our study.

Another study did Hasan *et al.*<sup>8</sup> in 40 patients with focal hepatic lesion, 24(60%) patients had malignant lesion and 16(40%) patients had benign lesion

One more study was done by Parikh *et al.*<sup>14</sup> on 211 patients, 136(64.4%) patients had a malignant lesion and remaining 75(36.5%) patients had benign lesions.

All the above studies were having similar findings with the majority of cases of malignant nature. But one study done by Rathore *et al.*<sup>5</sup> differ from our study in which it demonstrated maximum patient with benign lesion (64.4%) and malignant (35.5%).

Our study included 100 patients diagnosed with the hepatic focal lesion. The most prevalent lesion was metastasis which contributed 37% of the cases, followed by hepatocellular carcinoma seen in 25% of cases. The most common benign lesion was hemangioma 13% cases followed by hepatic abscess (8 %).

Matilde *et al.*<sup>12</sup> studied 100 patients with focal hepatic neoplasm. The study demonstrated the most common lesion as metastasis seen in 51(51%) patients which were followed by the hepatocellular carcinoma seen in 31(31%) and hemangioma noted in 9% of cases. This spectrum of finding resembled with the findings drawn from our study. Another study performed by Leeuvan *et al.*<sup>3</sup> and Glazer *et al.*<sup>15</sup> also showed similarity with metastasis as there most common lesion accounting for 37 patients.

## 5.7 Hepatocellular Carcinoma

Out of 100 patients, a total 25(25%) patients were diagnosed with hepatocellular carcinoma. The age of patients ranged from 21-80 years with the mean range being 62 years. The maximum number patients were seen in the age group 61-70 years and 71-80 years with 8(32%) patients in each group, followed by 5(20%) patients in the age group 51-60 years. The male preponderance was found in our study with 18 (72%) male patients and 7(28%) female patients. Out of the 25 patients, 11(44%)

patient showed the presence of cirrhosis and as cites.

This study was correlated with Baron *et al.*<sup>16</sup> which also showed the mean age of 58 years with patient age ranging from 17-83 years. The male predominance was also noted in the study with 77.3% male patients and 22.7% female patients.

Another study was done by the Hwang *et al.*<sup>17</sup> also showed higher sex ratio index with 39 male patients and 6 female patients (Image B).

## 5.8 Metastasis

In the study of 100 patients, we studied 37(37%) patients with a metastatic deposit in the liver. Age of the patients ranges from 21-80 years with mean age of 56.08 years. The maximum number of patients was seen in 51-60 age group with 11(29.7%) patients followed by 9(24.3%) patients in 41-60 years. Majority of the cases were evident in the male patients accounting for 22(59.4%) while 15(40.5 %) patients were female.

This finding was correlated with Soyer *et al.*<sup>18</sup> who showed the mean age of 59 years, however, the sex distribution was equal in this study. One more study did by Leslie *et al.*<sup>19</sup> showed the mean age of 61 years with the maximum case reported in male patients having a sex ratio of 29:18(M:F). Thus, showing identical sex distribution satisfying the findings in our study.

In the spectrum of primary malignancy of 37 patients, the most common primary malignancy was from the colon and rectum has 12(32.4%) patients, followed by the 6(16.2%) patients with Ca Breast and 3(8.1%) patients each of Ca Stomach and Ca Pancreas.

Our study group spectrum has similar finding with Matilde *et al.*<sup>12</sup> study in which 53 metastases were included, the majority from colorectal carcinoma 17(31.1%) cases. However, the second most common malignancy in this study was Ca pancreas with 11(20.7%) patients. In our case second most common primary was Ca Breast.

## 5.9 Hemangioma

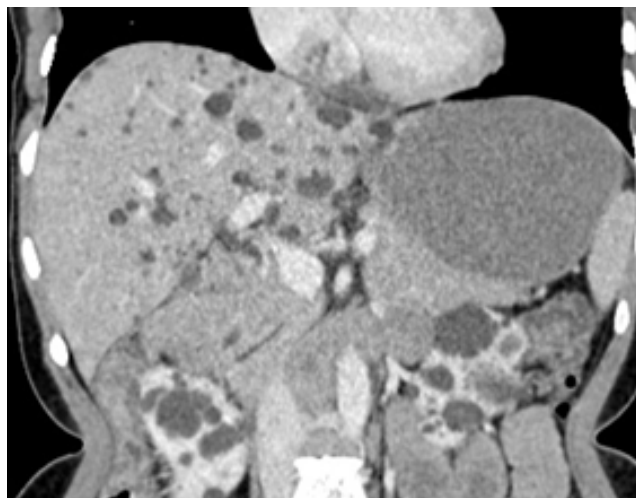
The hemangioma was reported in 13 cases of hemangioma in our study. This was the most common benign group lesion in our study, correlating to the study by Ahirwar *et al.*<sup>4</sup> The age of patients range from 31-80 years with mean age of 56 years. The male incidence was more in our study having 7(53.8%) patients as compared to 6(46.1%) female patients.

Our observation was correlating with a study done

B) MULTIPLE HEPATIC CYST



Portal Venous Phase



Portal Venous Coronal

Adam Y et al (13), Leslie et al (19), Yamashita *et al.*<sup>20</sup> and Leslie *et al.*<sup>19</sup> with mean age 49 years and 57 years respectively. Yamashita *et al.*<sup>20</sup> showed male predominance (M:F-5:1) which was observed in our study. But Leslie *et al.*<sup>19</sup> study demonstrated female incidence more as compared to male (M:F-17:27) (Image A).

5.10 Hepatic Abscess

Out of 100 patients, the hepatic abscess was found in the 8(8%) patient in our study. It was predominately seen in a

male patient with a maximum of cases seen between 61-70 age group of patient. The abscess was more commonly involved seen in the right lobe of liver 5(62.5%) patient and in left lobe around 3(37.5%) patient. The size of lesion seen in our study was less than 5 cm seen in 6 (75%) patients.

In a study was done by Mangukiya *et al.*<sup>21</sup> in 320 patients with hepatic abscess with a maximum number of cases seen in a male patient (80%) cases which correlated very well since all are 8 patient were male. The common site

A) SIMPLE HEPATIC CYST



Portal Venous Phase



Portal Venous Sagittal

observed in this study was right lobe of liver accounting for 83% of cases which in our study observed about 62.5% in the right lobe. In our study solitary lesion was found in all cases, however, in this study 21% cases had multiple lesions.

### 5.11 Hydatid Disease

6 patients were diagnosed with hydatid cyst. In this study was more common in male seen in 4 patient and 2 female patients. It was more commonly seen in the age group between 41-60 and 61-70 with a mean age of 48 years (ranged from 11-70 years). Majority of the hydatid cyst was located in the right lobe with size more than 5 cm and less than 5 cm equally distributed. In MDCT in all phases shows hypodense lesion in all patient. However, MDCT demonstrates calcification in 5(83.3%) patients.

In the study of Kayal *et al.*<sup>22</sup> majority of cases were observed in the fourth and sixth decade with mean age 40 years which was coinciding with our study. However male predominance was seen in our study which did not correlate with the study of Kayal *et al.* where sex incidence was seen more in a female patient (M:F-1:2). Another study Rao *et al.*<sup>23</sup> shows the maximum incidence of a female in abdominal hydatid as compared to male.

### 5.12 Intrahepatic Cholangiocarcinoma

In our study, one patient was diagnosed with intrahepatic cholangiocarcinoma. The age of the patient in our study observed was in the 30 years. However, in the study done by Horoshi *et al.*<sup>24</sup> and Yan *et al.*<sup>25</sup> had evident the mean age of 65 yrs and 66 yrs respectively in their studies which are slightly on the higher range as compared to our study.

One more study was done by the Zhou *et al.*<sup>26</sup> in 312 patients of intrahepatic cholangiocarcinoma had reported the mean age of 53 years with most common age group affected between 4-6<sup>th</sup> decade. He has also reported the incidence of intrahepatic cholangiocarcinoma in young patient accounting for 12.6% of cases with male predominance.

However, one study, done by Klein *et al.*<sup>27</sup> who studied 23 patient with primary liver carcinoma demonstrated one patient with intrahepatic cholangiocarcinoma in young male patient with 25 year age group which match exactly with our finding.

The pattern of enhancement observed in our study was peripheral hyperdense on an arterial phase on both portal venous phase and hyperdense in the delayed. Hyperattenuation of a tumour in delayed phases is characteristic. Our finding was corresponding to the study done Valls *et al.*<sup>28</sup> demonstrated the peripheral enhancement in the

57% cases in arterial and 60% cases in portal venous phase. 70% cases showed hyper attenuation in delayed phase which correlated with our study.

## 6. Conclusion

MDCT with a correlation of triple phase study is an excellent tool for diagnosis of the focal liver lesion by learning the degree and pattern of enhancement in all three phase thus helping in better characterization of the lesion. MDCT allows the reconstruction and reformation of images supported in detecting multiple lesions and early diagnosis of a focal lesion in the presence diffuse liver condition.

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Image A. Haemangioma



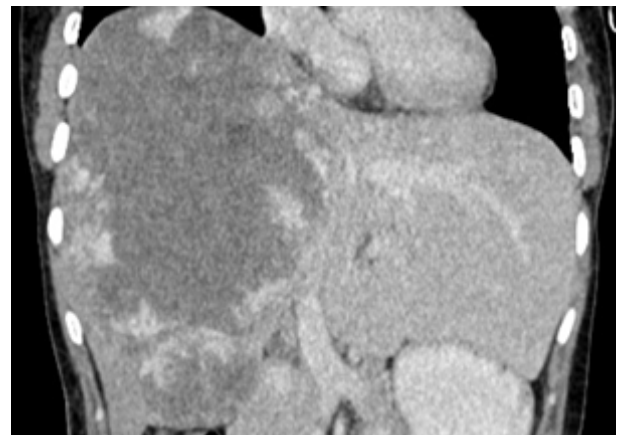
Nect



Hepatic Arterial Phase



Portal Venous Phase



Portal Venous Phase Coronal



Delayed Phase

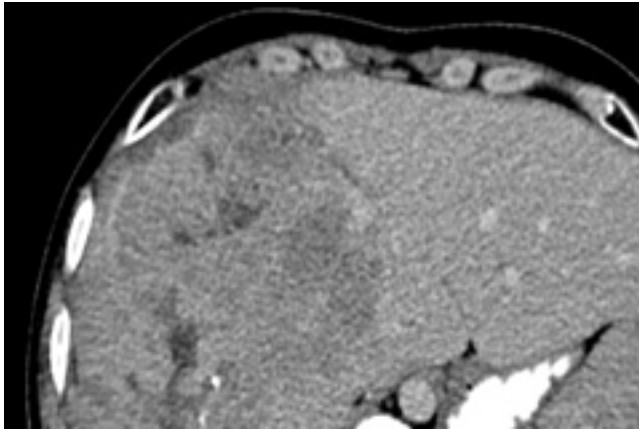
Image B. Hepatocellular Carcinoma



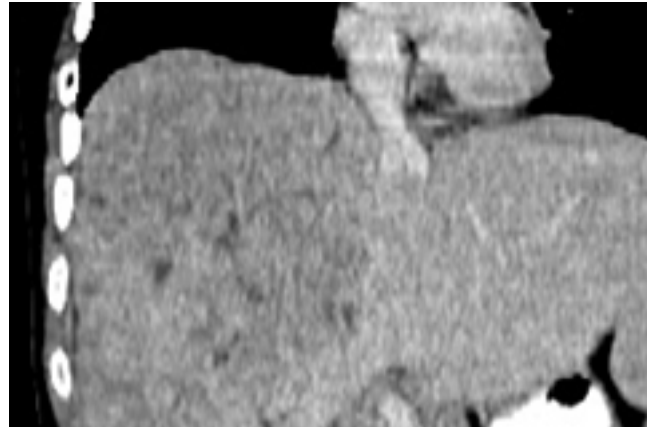
NECT



Hepatic Arterial Phase



Portal Venous Phase



Portal Venous Phase Coronal



Delayed Phase