

# EVALUATION OF NEOPLASTIC LIVER LESIONS BY TRIPLE PHASE CT

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## ABSTRACT

**Background:** Liver neoplastic lesions are common clinical and radiological problem and cauterizing them as benign and malignant is important. Objectives of the study using triple phase CT as diagnostic modality to study the characteristic features of various hepatic lesions, differentiating benign from malignant lesions and correlating triple phase CT findings with clinical and histopathology or post-operative findings for evaluation of its efficacy.

**Methods:** A total of 100 patients were studied during period of December 2017 to January 19, in this cross-sectional study done in Department of Radiodiagnosis, Grant government Medical College, Mumbai, Maharashtra, India. All patients underwent triple phase CECT examination and its accuracy, sensitivity and specificity was calculated.

**Results:** Triple phase CT be excellent diagnostic modality for characterisation and better evaluation of hepatic masses with sensitivity of 90.2% , specificity 94.9% , PPV 92.3% and NPV 96.1%. The sensitivity and specificity of triple phase CT to diagnose hepatic malignant lesions is 94% and 96.1% respectively.

**Conclusions:** It is helpful to evaluate and differentiate benign and malignant hepatic lesions by Triple phase CT which helps in guiding appropriate management High accuracy is helpful in confident diagnosis of a hepatic lesion. It has valuable role in characterizing, and identifying primary malignancy diagnosis in cases of multiple liver metastases from unknown primary.

**Keywords:** Hepatic masses, Benign, Malignant, Arterial phase, Portal venous phase, Delayed phase, Triple phase CT.

**INTRODUCTION** Liver is more prone to various neoplastic lesions including benign and malignant because of rich blood supply by hepatic artery and portal vein, its metabolic function and detoxification. Normally blood supply to liver is mainly portal vein(70%), however most of the liver tumors receives their blood from the hepatic artery, thus reverses the normal proportion of hepatic blood supply and hepatic artery which becomes the prime source of blood supply. These difference in pattern of blood flow forms the basis of triple phase scan of liver and also differentiate the imaging features of primary and metastatic liver lesions. Triple phase CT is very helpful in distinguishing a benign lesion from malignant. Triple phase CT is also helpful for detection and characterization of hepatic tumors those

which may require aggressive surgical intervention and which require palliative treatment.

## METHODS

**Inclusion criteria:** This is prospective study was performed in the department of Radiodiagnosis in tertiary health care institute including 100 patients with different chief complaints over a period of 14 months. Patients of all age groups were included irrespective of sex. Study population included all patients with suspicion of hepatic masses on clinical, laboratory or Ultrasonography findings.

**Exclusion criteria:** Patients with history of allergic reactions to contrast, renal failure, pregnant and patients with focal liver lesions with infective etiology like hydatid cyst and liver abscess are excluded.

**Technique:** The study group patients were evaluated with triple phase CT scans were done on 128 slice Siemens Somatom definition flash machine. Triple phase CT was done after detailed oral and written consents. Triple phase CECT 1 Arterial phase was taken at 35-40 sec after contrast injection. Lesions supplied by hepatic artery enhanced maximally in this phase. 2 Hepatic or late portal phase was obtained at 70-80 sec after contrast injection. Hepatic veins enhanced in this phase with maximal enhancement of hepatic parenchyma. Hypovascular lesions were best evaluated in this phase. 3 Delayed or equilibrium phase was obtained after 2-10 minutes after the contrast injection. The tumors washed out rapidly became visible in this phase. Common contrast agent used in the study was Diatrizoatemeoglumine and Diatrizoate sodium 76% both orally and I.V. 1000 to 1500 cc oral contrast was given 30 min prior to procedure. The

injection rate for IV contrast was 2.5-5 ml/sec, and complete contrast is administered in approximately 30 sec. Statistical methods Statistical analysis was done using computer software.

## RESULTS

In present study, population comprises of cases with age ranging from 1 year to 79 years with the maximum number of cases in the age group of 41 to 50 years (30%). 54% of cases were males and 46% females.

Table 1: Age wise distribution of patients.

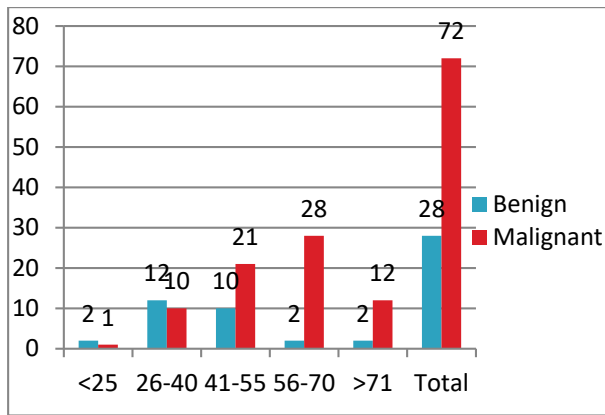
Age	Number of patients	Percentage
<25	3	3.0
26-40	22	22.0
41-55	31	31.0
56-70	30	30.0
>71	14	14.0
Total	100	100.0

Table 2: Sex wise distribution of patients.

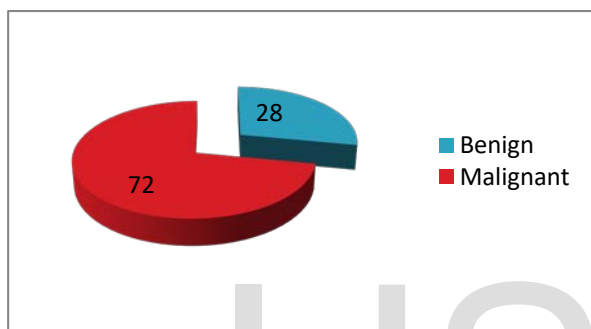
Sex	Number of patients	Percent
Male	54	44.0
Female	46	56.0
Total	100	100.0

Table 3: age wise distribution of patient as per CT diagnosis into benign and malignant

Age	Benign	Malignant	Total
<25	2	1	3
26-40	12	10	22
41-55	10	21	31
56-70	2	28	30
>71	2	12	14
Total	28	72	100



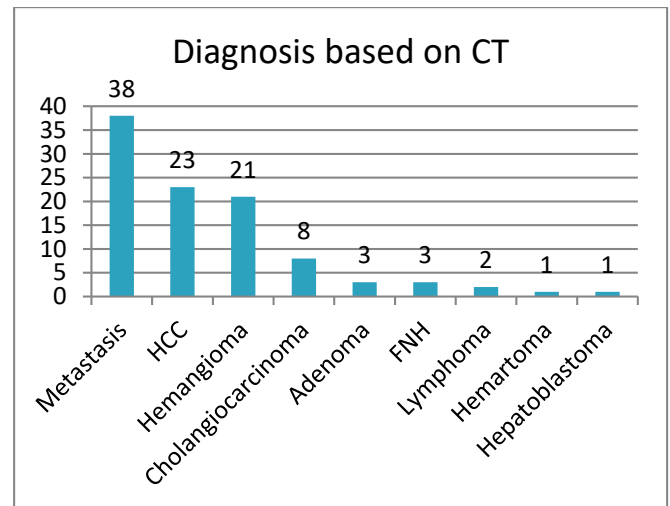
Total number of benign and malignant patients:



There were 72 malignant and 28 benign tumours in the study. Among them 56 were diagnosed correctly on triphasic CT (94.9%). Malignant lesions can be diagnosed by triphasic CT with an accuracy of 93%, sensitivity and specificity of 94% and 96.1% respectively. Benign lesions should be differentiated confidently from malignant for better management of patients.

Characterisation of liver lesion like morphology, vascularity, calcification and its complications with the help of triple phase CT is also helpful in differentiating benign from malignant and also helps to define primary lesion, especially in cases of unknown primary with its further management.

Diagnosis based on Triple phase CT:



Largest group was formed by liver metastases with total 38 cases (38%). Majority of cases were in age group of 41 to 55 years (44.4%) followed by 55- 70 years (30.5%). Second largest group was of HCC with total number of 23 cases (23%) with majority of cases in the age group of 55-70 years. Most common primary benign and malignant hepatic masses were hemangioma is 21% and HCC is 23% respectively.

Hemangioma was commonly seen in females (64.5%). While HCC is 72.9% and secondary liver metastases is 59.3% in males. Overall accuracy of diagnosing in hepatic mass by triphasic CT was 96.2%. Triple phase CT is excellent for characterization and better evaluation of hepatic masses with sensitivity of 90.2%, specificity 94.9%.

There were 72 malignant and 28 benign tumors in the study. Among them 68 were diagnosed correctly on triphasic CT . Malignant lesions can be diagnosed by triphasic CT with an accuracy of 93%, sensitivity and specificity of 94 % and 96.1% respectively.

Maximum numbers of cases of Adenoma were in age group 31-40 years (71.4%).

For hepatic adenoma, Triphasic CT has diagnostic accuracy of 99%, sensitivity 85.7% and specificity 100%. 3 were diagnosed correctly on triphasic CT. It has diagnostic accuracy of 98%, sensitivity 88.9% and specificity 98.9%.

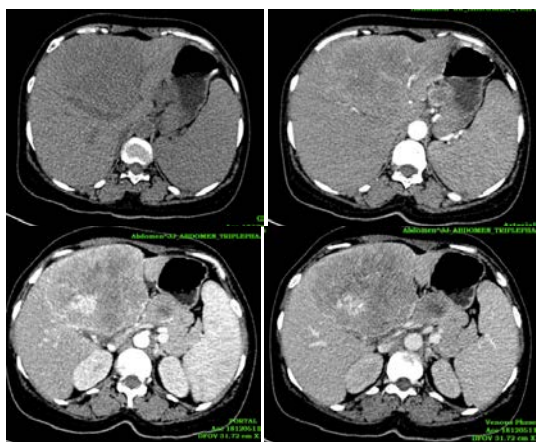
## DISCUSSION:

### Metastases:

All of the lesions(38cases) had rapid wash out of contrast and were hypodense in delayed phase. Out of 38 cases of metastasis most of the cases (34 cases) had lesions with well defined margins (89.4%) and 14 cases (36.8%) demonstrated enhancement in the arterial phase among which peripheral continuous enhancement was seen in 5 lesions (35.7%) and complete in 7 cases (50.0%). 19 cases (50%) enhanced in portovenous phase. Figure 11: CECT abdomen revealing multiple enhancing hypervascular liver metastases, in the arterial phase of triphasic CT

### Hepatocellular carcinoma:

**Figure no 01:** Showing early washout of contrast in venous phase

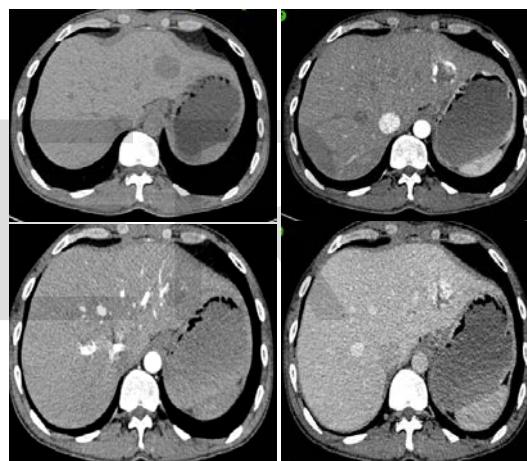


On NCCT out of 23 cases, 13 lesions were hypodense (56.5%). All lesions showed early enhancement (100%) in arterial

phase with rapid washout in Porto venous phase and all were hypodense in delayed phase (100%). 15 lesions had capsular enhancement in delayed phase (64.3%). Out of which 6 cases had portal vein thrombosis (23.0%) which is another one of the characteristic features of HCC. 18 Thus it was found that triple phase imaging with arterial, porto-venous and delayed phases was advantageous in the evaluation of HCC

### Hemangioma:

**Figure no 02:** showing gradual centripetal filling of hemangioma in porto-venous and delayed phase

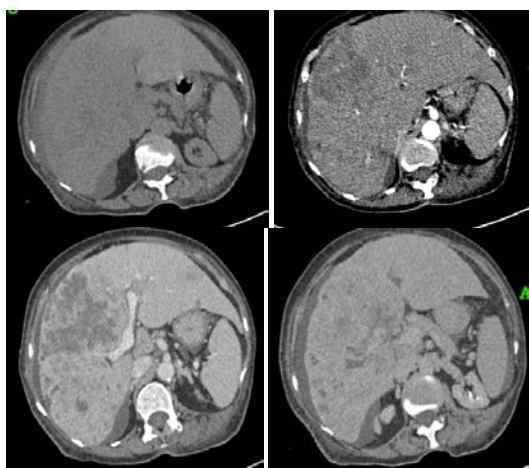


In our study 16 cases were females and 5 males. Aytekin et al, have described that hemangioma are more common in females. Most of them are small(<10cm) in size, however few are large (>10cm) in size and maximum number of cases had single lesion. Out of 21 cases 17 cases were hypodense (80.9%) on plain scan. On post contrast scans, all lesions (100%) showed enhancement in arterial phase with progressive centripetal filling in portal venous and delayed phases. Central cystic areas were seen in 2 cases, both of size more than 10 cm. Figure 9: HCC CECT abdomen, showing heterogeneously

enhancing lesion in arterial phase of triple phase CT.

### **Cholangiocarcinoma:**

**Figure no 03:** Showing delayed contrast enhancement of lesion on delayed phase and capsular retraction.



All 8 cases had jaundice and hyperbilirubinemia at clinical presentation and all were males (100%) and are in the age group greater than 60 years. Bloom et al, has described similar features in their study. All the cases in present study had single lesion (100%), 4 lesions were subcapsular and all had capsular retraction (100%). 7 lesions were hypodense (87.5%) on NCCT and all cases (100%) shows enhanced in delayed phase (100%).

**Adenoma:** All the 3 cases were females (100%) and maximum in age group 31- 40 years (71.4%). All lesions were well defined (100%).

**FNH:** All 3 cases were middle aged females (100%) and all lesions demonstrated well defined margins (100%). Diagnosis of FNH was made on CT which was later confirmed by histopathology.

**Lymphoma:** Two middle aged male patients(51-60yrs)had a well-defined hypoechoic lesion in the liver. Lesion was hypodense on plain CT and did not show enhancement in arterial and PV phase mild enhancement was observed in delayed scans after 10 minutes of contrast injection, it was diagnosed as lymphoma. Retroperitoneal and mesenteric lymphadenopathy was also noted. Diagnosis was confirmed on histopathology as lymphoma.

**Hepatoblastoma** In a four year old boy who presented with complain of abdominal distension triple phase CT scan was performed. Lesion was hypodense on plain CT, demonstrated heterogenous enhancement in arterial phase and become hypodense in portovenous and delayed phases.

### **FINDINGS**

Triple phase CT proved to be an excellent diagnostic modality for characterisation and better evaluation of hepatic masses with sensitivity of 90.2%, and specificity 94.9%.

### **CONCLUSION**

Triple phase CT is an excellent modality with great accuracy is highly helpful in diagnosis of hepatic masses, and had important role in management of both benign and malignant hepatic lesions and also helped in reaching primary malignancy diagnosis in cases of multiple liver metastases from unknown primary. Triple phase CT is better in understanding of the vascular property of the tumor which helps in diagnosis as well as management protocol.

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