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**ORIGINAL ARTICLE**

# The Efficacy of CT Scan in Evaluation of Hepatic Tumors taking Histopathology as Gold Standard

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## ABSTRACT

**Background and Aim:** The prevalence of hepatic tumors is most common among developing countries of Asia compared to Europe and Western countries. In Pakistan, hepatic tumors are the 4$^{th}$common disorder. The current study aims to evaluate the efficacy of hepatic tumors taking histopathology as a gold standard.

**Materials and Methods:** This cross-sectional study wascarried out on 120 patients who underwent CT scans for hepatic tumors inradiology department of Sughra Shafi Medical Complex / Sahara Medical College, Narowal and Children Hospital &Institute of Child Health,Multan during the period of six months from 1$^{st}$ September 2020 to 2$^{nd}$ March 2021. The age range for all the patients was 29 to 80 years with mean ±SD(52±5.32) followed by hepatic tumors diagnosed based on histopathology as agold standard and assessed with CT. The prevalence of colorectal carcinoma was 22(18.33%), while other common parameters were pancreas, stomach adenocarcinoma, and biliarytree 13 (10.83%), and hepatocellular carcinoma 85 (70.84%). Unresectable tumors inpatients were assessed with percutaneous biopsy of the hepatic lesion and correlatedwith CT results. Resectability predictionwas assessed with CT findings accuracy in all the patients who had tumors onthe basis of CT images and had surgery.

**Results:** All the patients of hepatic tumors were assessed with CT scans and histopathology was taken from each participant. Accuracy, sensitivity and specificity of CT scans was 67.33%, 62.35% and 73.85% respectively. The positive and negative predictive values were about 75.71% and 60% respectively. Statistical significance was ($P<0.05$) set as a standard.SPSS version 20 was used for data analysis.

**Conclusion:**Our study found that hepatic tumors can be assessed byarterial portography with resectability by CT scans. In our study, out of 120 patientshad spared surgery and only 17% of patients were considered as resectable duringarterial portography on CT scans findings. CT scanplays a pivotal role in assessing hepatic tumors. Accuracy, sensitivity and specificity of CT scans was 67.33%, 62.35% and 73.85% respectively. The positive and negative predictive values were about 75.71% and 60% respectively.

**Keywords:**Hepatic Tumors, CT scans,Histopathology

## INTRODUTCION

Hepatic tumors can be detectedwith the most sensitive arterial portography by CT scans while small tumors withsmall nodules go undetected on CT arterial portography and are considered non-specific tumors [1]. Hepatic tumors can also be detected with Infusion HepaticArteriography (IHA) on CT [2]. Hepatic arteries supply blood to the liver and IHAimages are taken with an infusion of contrast medium and portal vein and CTAPimages are taken via the portal vein. It was expected that depict tumors would goundetected on CTAP with CATIH and converse. The imaging of CTAP, CTIHA, andtheir combination carried out on detecting tumors matched our results [3]. CT of various types such as CTAP,sonography, delayed CT, arterial portography, incremental CT, and arteriographycompared the sensitivity for hepatic tumors detection. The highest rate ofsensitivity was detected for CT during arterial portography however, in resectabilitydetermination maximum sensitivity was found for individual lesion detection [4-8].Other studies included accurate assessment for local invasion of the lesion, degreeof lesion margin, vascular invasion, and extrahepatic disease extrusion. Additionally,all detected masses are not malignant, some may be hemangiomas and cysts. It wasdifficult to know malignant patients' tumors by minimizing false-positivefindings of CT during arterial portography [9].

In Pakistan, the prevalence of hepatic tumors was 3.7% to 16.7% as reported by various studies [10-12]. Another study found an 11% prevalence of hepatic tumors [13]. Comparing the hepatic tumors in Pakistan to other countries, the high prevalence was found in Spain (6.6%), Italy (19.7%) and Japan (39%) [14].the radiological approach hasbeen modified in regard to CT imaging. The entire hepatic tumor can be scannedtwice with faster CT scans availability, once during the portal venous phase (PVP) and hepatic arterial phase (HAP). These images can be used for the detection oftumors characterization and lesion of hypervascular hepatic. Based on the hepatic disorder, Pakistan ranked 4th in Asia [15]. Higher sensitivity was reported in hepatic tumors detection [16]. CT diagnostic accuracy has been found 80% in a hepatic study conducted on 32 cases in a cross-sectional study [17]. Proven cases were reported primarily on retrospective evaluation as proved by pathological assessment. Lower sensitivity was reported in the USA and Europe.

The aim of the current study wasto assess the efficacy of CT scans in the evaluation of hepatic tumors. Patientshaving known hepatic mass lesions and malignancy into resectable wereinvestigated. CT findings during arterial portography with lesion were studiedwith successful resection procedure with prediction.

## MATERIALS AND METHODS

This cross-sectional study was carried out on 120 patients who underwent CT scans in radiology department of SughraShafi Medical Complex / Sahara Medical College, Narowal and Children Hospital &Institute of Child Health,Multanfor hepatic tumors during the period of six months from 1st September 2020 to 2nd March 2021. The age range for all the patients was 29 to 80 years with mean ±SD (52±5.32) followed by hepatic tumors diagnosed based on histopathology as a gold standard and assessed with CT. The prevalence of colorectal carcinoma was 22 (18.33%), while other common parameters were pancreas, stomach adenocarcinoma, and biliary tree 13 (10.83%), and hepatocellular carcinoma 85 (70.84%). Unresectable tumors inpatients were assessed with percutaneous biopsy of the hepatic lesion and correlated with CT results. Resectability prediction was assessed with CT findings accuracy in all the patients who had tumors on the basis of CT images and had surgery.These 120 patients, including 97men and 23 women formed the study population. Malignant hepatic nodules wereexpected to have one by four in ratio. Imaging technique CT scans were used forthe findings and diagnosis of hepatic tumors. The presence of primary carcinoma andtumor level evaluation inside the blood where the parameters were found. The hepatic tumor was diagnosed based on hepatitis presence as a possible indicator. A biopsy investigation was carried out for tumor risk and seeding.

**Imaging Technique and Pathological Analysis:** CT suite was utilized after cathetersof CTIHA and CTAP while patients were placed accordingly. For catheterizationof the coaxial balloon, the inner catheter was placed in the hepatic artery properly andthe outer one in the celiac artery. In caseof venous return from the spleen or left hepatic artery coming from the left gastricartery to the left renal vein, this technique could not be utilized. Superior mesentericartery and hepatic artery catheters out of two artery access were placed.CTAP was followed by CTIHA. Salinewith a diluted contrast medium contains 150-160 mg I/mL and 120-160 ml with the infused rate of 2.5-3.5 ml/sec. Contrast medium is infused in the gap of the innerand outer catheter with a coaxial catheter balloon system. Careful infusion of the balloon under theobservation of fluoroscopy was carried out on patients who moved to CT. The catheter is placed in the superior mesenteric artery with an infusion of contrast medium in twoarterial accesses in patients. Hepatic scanning through CT started 20-30 secondsafter injection of contrast medium in each case.

A radiologist interpreted the CTAP scans report and lesions of any size and shape other than segment or wedge were considered tumors. While porta hepatic or anterior segment or gallbladder perfusion defects were not included in tumors. Cysts were excluded by sonogram and CT scans critical review.Enhancement of rim with or without nodular lesions were considered as tumors. The surgical specimen was analyzed pathologically as a gold standard for final diagnosis. The absence of hepatic tumors after surgery was evaluated by sonography and intraoperative scanning. The pathological analysis did not confirm the presence of nodular lesions.

**Statistical Analysis:** Data analysis was carried outwith SPSS version 20. Categorical variables such as age, gender, hepatic tumors, and CT scans sensitivity was calculated. The sensitivity of CT scans andprocedural simulations were utilized to detect and compared the malignanttumors with the chi-square test. CT scanswere evaluated by a radiologist after pathological analysis. A statisticalsignificance ($p<0.05$) was considered as a significant value.

## RESULTS

Of 120 hepatic tumors patients, the prevalenceof colorectal carcinoma was 22 (18.33%), while other common parameters werepancreas, stomach adenocarcinoma, and biliary tree 13 (10.83%), andhepatocellular carcinoma 85 (70.84%) as shown in Figure 1 and Table 2 and Figure 2. These 120 patients, including 97 (80.83%) men and 23(19.17%) women formed the study population as shown in Table 1.All the patients of hepatic tumors wasassessed with CT scans and histopathology was taken from each participant.Accuracy, sensitivity, and specificity of CT scans was 67.33%, 62.35%, and 73.85%respectively. The positive and negativepredictive values were about 75.71% and 60% respectively. Statisticalsignificance was ($P<0.05$) set as a standard. Hepatic tumors differences asshown in Figure 3 in which hepatocellular carcinoma is dominant over portal venoussystem confirmed by pathological analysis. Hypo attenuating nodule (Arrow) wasseen in CT scans during hepatic arteriography infusion (A). Hypoattenuating nodulesappears as a portal branch. During arterial portography, while taking CTscans shows enhanced hepatic parenchyma with the same amount (B). Additional lesionsfailure on simulation interpretation was not detected on CTAP and CTIHA.

Table 1. Gender distribution

| Gender | Frequency (n) | Percentage (%) |
|---|---|---|
| Female | 23 | 19.17 |
| Male | 97 | 80.83 |

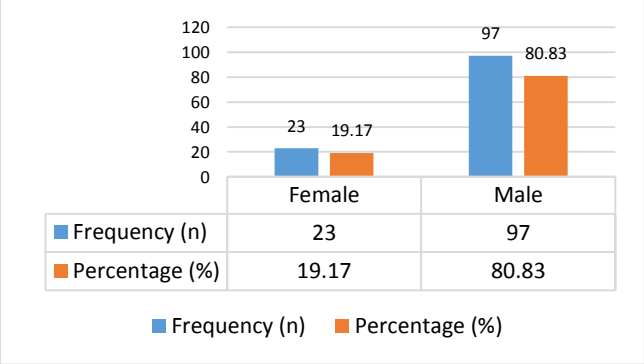


Figure 1. Gender distribution among 120 patients

Table 2. The prevalenceof hepatic tumors parameters

| Hepatic tumors parameters | Frequency (n) | Percentage (%) |
|---|---|---|
| Colorectal Carcinoma | 22 | 18.33 |
| Pancreas, stomach adenocarcinoma, and biliary tree | 13 | 10.83 |
| Hepatocellular carcinoma | 85 | 70.84 |

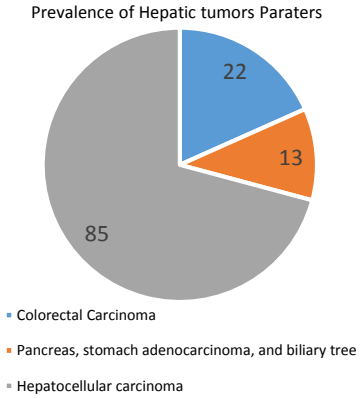


Figure 2. Prevalence of Hepatic tumors parameters

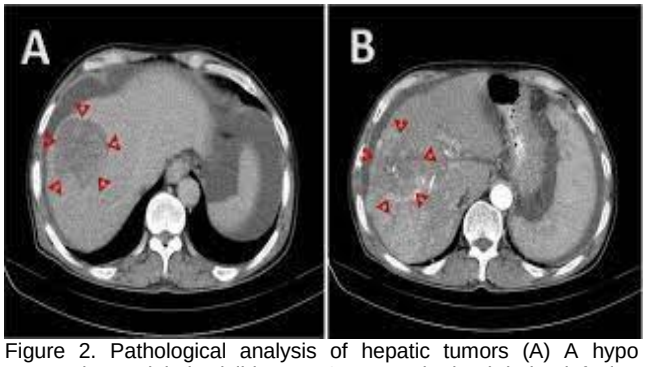


Figure 2. Pathological analysis of hepatic tumors (A) A hypo attenuating nodule is visible on a CT scan obtained during infusion hepatic arteriography. (B) A nodule is visible on a CT scan obtained during arterial portography. Is enhanced in the same way that the hepatic parenchyma is.

## DISCUSSION

In our study, various CT scanssuch as CTAP, CTIHA, and simulation use give no statistical significance intheir sensitivities. In contrast to our study, Chezmar et al [18] found improvementin detecting hepatic tumors when CTAP and CTIHA were combined. Due to the variancein CT types, there were discrepancies among accuracy, sensitivity, andspecificity of the CT scans. We used slip-ring CT scanners to obtain wholeliver images in a single breath-hold, whereas Chezmar et al. used arotate-rotate CT scanner, which may have resulted in misregistration of small tumorsdue to differences in depth at each respiration.With the better hepatic enhancement, CTAPdetectability of tumors could be optimized with images while systematic circulationreturns the hepatic artery before contrasting medium [19]. Rapid imagingacquisition has been enabled with slip-ring CT scans. Irrespective of the phasewhether it is capillary, artery, or venous no known tumors detectability can be optimized in CT arteriography. All the angiographic images consist of a mixture andCT arteriography would be obtained with contrast medium infusion. CTAP scanningquality was compromised as the density of hepatic tumors and parenchyma increasedup to 35 g of iodine while using CTAP scanning.

Our study has many limitations, one of them is the pathological examination of nodules instead of whole liver or hepatic which might regard the true lesions as pseudolesions on CT scans. CT arteriography detected 98% better tumor detection compared to CTAP scans during three phases. But this method is time costly as it takes 13 single-level dynamics.The malignant process can beidentified from benign one with defects assessment based on shape. Although CTAPdetected nonspecific perfusion defects. Benignity could be perfusion defects in a wedge or peripheral shape. Our study found nodular defects differentiationbased on important factors such as size and shape. Besides that, Of 120 hepatictumors patients, the prevalence of colorectal carcinoma was 22 (18.33%), whileother common parameters were the pancreas, stomach adenocarcinoma, and biliary tree13 (10.83%), and hepatocellular carcinoma 85 (70.84%). These 120 patients, including 97 (80.83%) men and 23(19.17%) women formed the study population.

Percutaneous biopsy can confirm the preoperative diagnosis after dynamic CT and MR imaging studies help to differentiate the nodules. A nodular defect that is less than 1.5 cm in diameter, on the other hand, may be benign. Percutaneous biopsy specimens of small nodules can be difficult to obtain. Our findings suggest that CTIHA may be useful in distinguishing between malignant and benign small cell lung cancer.

## CONCLUSIONS

Our study found that hepatic tumors can be assessed by arterial portography with resectability by CT scans. In our study, out of 120 patients had spared surgery and only 17% of patients were considered as resectable during arterial portography on CT scans findings. CT play a pivotal role in assessing hepatic tumors. Accuracy, sensitivity and specificity of CT scans was 67.33%, 62.35% and 73.85% respectively. The positive and negative predictive values were about 75.71% and 60% respectively.

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