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Original Research Article

Role of Biphasic Computed Tomography Scan in Characterization of Liver Lesions

Zughla Iqbal[1*], Rehan Afsar[2], Muhammad Ahmad Naeem[3], Muhammad Waqas Aleem[4], Narjis Batool[5], Abid Ali[6]

[1]Medical Imaging Doctor, Department of Radiological Sciences and Medical Imaging, University of Lahore, Gujrat, Pakistan
[2-5]Lecturer, Department of Radiological Sciences and Medical Imaging, University of Lahore, Gujrat, Pakistan
[6]Associate Professor, Department of Allied Health Sciences, University of Lahore, Gujrat, Pakistan

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***Corresponding author:** Zughla Iqbal

Abstract

Purpose: The aim of this research was to look at liver lesions on dual step computed tomography scans in people who had liver masses. In asymptomatic patients with normal liver function, an early diagnosis is beneficial. That also means the tumors can be treated more effectively with medications and radiotherapy. ***Material and Method****:* On ultrasound, 150 patients were shown to have a liver disease. 120 people were shown to have liver lesions after undergoing a biphasic CT scan. Following the maintenance of the IV-line, injection was injected using a pressure injector, and acquisition began. The arterial process was recorded for 15-20 seconds, and the portal venous phase was recorded for 50-60 seconds. Out of 120 cases, 30 had hypo vascular lesions that did not improve in both phases of the CT scan. This finding showed full enhancement on both arterial and venous phases on 25% of hypo vascular lesions and 75% of hyper vascular lesions. ***Conclusion:*** Biphasic computed tomography is an excellent diagnostic technique for detecting liver lesions whose visibility is based on their vascularity.

Keywords: Computed Tomography, Biphasic scan, liver lesions, hypervascular.

INTRODUCTION

Focal hepatic lesions are the most prevalent type of hepatic disease. The two most prominent types are benign and malignant hepatic lesions. The most prominent benign lesions include cystic lesions, nodular focal, hyperplasia infections, hemangioma, adenoma of the liver, billary hamartoma. Hepatocellular carcinoma, cholangiocarcinoma, lymphoma, and sarcoma are examples of malignant tumors that are usually metastatic [1]. Viral, infectious, parasitic, and amebic infections may all affect the liver. Hemangiomas are the most frequent vascular tumors of the liver [2]. These lesions can develop as a consequence of blood vessels dilation [3]. Examples of hepatic cysts include abscess, cyst adenoma, metastatic cyst and hydatid cyst [4]. A small cyst has a thin wall, is unilocular, and is usually asymptomatic, whereas a large cyst may be mildly symptomatic [5]. If the cyst has a dense division or masses within it, it can be classified as an abscess or a neoplastic cyst due to its increased vascularity. Regenerative nodules may develop as a result of cell necrosis or blood circulation changes [6] Hepatic adenoma is a benign tumor that develops in females who take hormone medications or oral contraceptives [3, 7] Focal nodular hyperplasia is a strong and is a solid hyper vascular lesion. Cholangio carcinomas may be either intrahepatic or extrahepatic in nature. There are malignant lesions that are hypervascular [8]. The liver is the most popular place where mets from the gastrointestinal tract, pancreas, breast, and lungs can migrate. Calcification is possible with these mets [7]. In clinical diagnostics, computed tomography plays a critical role. It has a strong degree of precision when it comes to identifying and staging liver lesions. The foundation for detection of a lesion at multi phasic MDCT is increased tumor enhancement relative to the underlying liver parenchyma during the hepatic arterial process [9, 11]. Any essential parameters are taken using the images, such as the scale of the lesion, vascularity of the lesion, and so on. It's critical to use high injection rates and bolus timing that are also accurate. During the arterial process (starting 15-20 seconds after a bolus injection), the liver tumors would be greatly increased, however during the portal venous phase, they will have a density close to that of enhanced regular parenchyma (50-60 sec). Some tumors are more visible during early-phase arterial scanning (25 seconds after the start of the bolus injection), whereas others are more visible later, 35 seconds after the start of the bolus injection. Since the initial triphasic-phase protocol has

been completed, delayed photographs between 5 and 10 minutes have been obtained [10]. Lesions may be classified into two categories based on their enhancement. Hyper vascular lesion and hypo vascular lesion are two different types of vascular lesions.

MATERIAL AND METHOD

From December 2020 to March 2021, the research was performed at a private hospital in Gujranwala. The information was gathered from CT films and records. Patients of all ages were included in the report, which had a sample size of 150 patients. Patients with a serum creatinine amount greater than 1.5 mg/dl, no liver mass on abdominal ultrasound, and pregnant women were both excluded from the study. The images were taken using an Aquilion multi slice helical CT scan computer. The experienced radiologists diagnosed both of the CT cases. A multi-slice computer tomography was used to scan the liver many times in a very short timeframe using a bolus infusion of the contrast media. It was necessary to repair the IV thread.

To inject 100 ml of contrast media, a pressure injector was used. After 15-20 seconds of bolus injection beginning, the arterial process was taken. Then the venous process of the injection portal was taken in 50-60 seconds. The arterial process was also taken early and late. In comparison, improved axial representations of the arterial stage of biphasic CT have been seen better for the lesions. Most of the axial images had been preferred, but sagittal and coronal images had to be carefully assessed. All data has been processed using the Excel 365 and SPSS version 21. For all numerical or quantitative attribute, such as gender, hyper vascular injury prevalence and hypo vascular lesion mean and percentages are measured. Different frequencies were expressed with graphs, charts, components and several pie map.

RESULTS

Thirty patients out of 150 had a regular liver on CT and were therefore omitted from the analysis. A total of 120 patients with liver lesions is represented. 70 (58.3 percent) of the 120 patients were females, while 50 (41.7 percent) were males.

The arterial enhancement as well as the venous enhancement or washout process is seen in hyper vascular lesions. Out of 120 people, 90 had hyper vascular lesions, meaning they revealed all phases of the biphasic CT scan in 100 percent of the cases. There was no washout process in the hemangiomas, and both phases showed full improvement. In both stages, the map depicts the improvement. On biphasic computed tomography, all hyper vascular lesions have arterial and venous enhancement, according to this analysis (Figure 3). Finally, in the arterial process, the result for hyper vascular lesion is 100%. Thirty patients out of a total of 120 had hypo vascular lesions that did not improve in either step of the CT scan. This finding showed that 25% of the participants had hypo vascular lesions and 75% had hyper vascular lesions.

RESULTS

Out of 150 patients, 30 patients showed normal liver on CT, hence were excluded from the study. 120 patients represented with liver lesions. Out of these 120 patients, 70(58.3%) were females and 50(41.7%) were males.

For hyper vascular lesion showed arterial enhancement and also venous enhancement or washout phase. Out of 120 patients, 90 patients presented hyper vascular lesions i.e., showed both phases of biphasic CT scan in 100% cases. In the hemangiomas there was complete enhancement in both phases and no washout phase. The chart shows the enhancement in both phases. (Figure 3) This study concluded that all hyper vascular lesions have arterial enhancements as well as venous enhancements on biphasic computed tomography. Finally, the result for hyper vascular lesion is 100% in arterial phase. Out of 120 patients, 30 patients presented hypo vascular lesions and showed no enhancement in both phases of CT scan. In this result 25% represented with hypo vascular lesions and 75% with hyper vascular lesions.

Table-01: Gender Distribution

		Frequency	Percent
Valid	male	50	41.7
	female	70	58.3
	Total	120	100.0

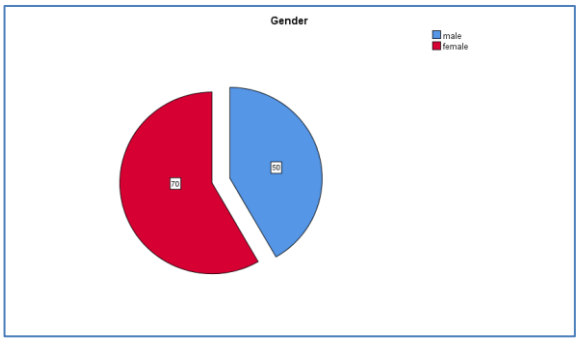

Fig-01: Pie cart describing the gender distribution

Table-02: Vascularization pattern of liver lesions

		Frequency	Percent
Valid	hyper vascular	90	75.0
	hypo vascular	30	25.0
	Total	120	100.0

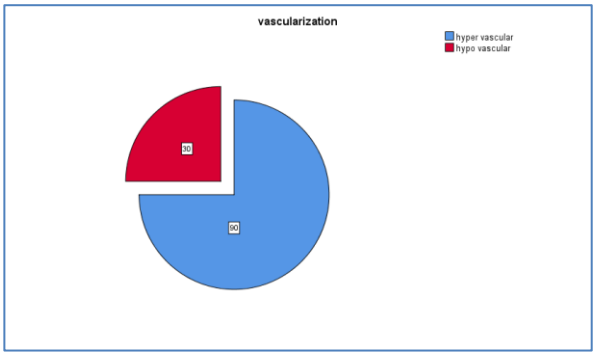

Fig-02: Pie chart showing vascularity percentage

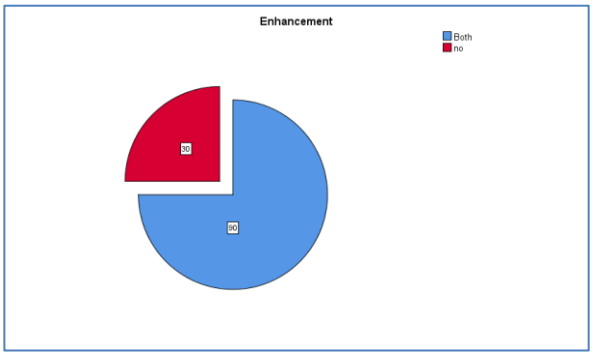

Fig-03: Pie chart showing both (arterial and venous) enhancement in hyper vascular lesions

DISCUSSION

The vascularity of a liver lesion remains a source of debate. Early research revealed that a lesion in the liver receives blood from the hepatic artery. However, new research has shown that the portal vein plays a role in blood flow as well. It's possible that collaterals would be included [12]. According to another report, adenocarcinoma receives 80 percent of the blood flow from the hepatic artery and 20% from the portal vein [13]. The hepatic artery, on the other hand, is the primary blood source for liver lesions. The vascularity of a lesion varies depending on the form of lesion as the tumor becomes larger. Hyper vascular and hypo vascular lesions are the two most common forms of lesions. The hypervascular lesions are cancerous lesions.

While biphasic computer tomography is better for hypervascular lesions, it has been observed that the lesion becomes iso extreme with the liver after contrast administration in certain cases, especially when the contrast injection dose is insufficient. Then it's easier to see the lesion on an unenhanced scan [14]. Since it is impossible to distinguish between small lesions and hypertense vessels on an unenhanced scan, it is not ideal for detecting small lesions. It has to do with the unenhanced CT scan's poor sensitivity in detecting liver lesions. As a result, it can be concluded that the arterial process is better at detecting minor lesions. The arterial process increases the likelihood of detecting minor lesions and hypervascular lesions. Previously, only hepatocellular carcinoma with very slow-paced contrast infusion was tested with biphasic machine tomography and a delayed scan took six minutes after contrast [15]. However, it was essential for the scanner to collect images on the whole liver during a brief amount of time, such as six seconds after the injection of contrast content, while the Arterial Process was required, and then the patient is permitted to breathe for a few seconds, such as 10-20 seconds, until the portal requires 50-60 seconds [16].

To optimize arterial enhancement, an optimal injection rate is chosen. The arterial process of computer tomography is the strongest at detecting liver lesions. On the arterial phase, hypervascular lesions exhibit complete enhancement. The outcomes of this research corroborated these findings, as the hypervascular lesion was fully improved. The venous process as well as lesion diagnosis in both kinds of lesions. The venous process, on the other hand, is unreliable when used alone. As a consequence, hypervascular lesions seem to be more improved on biphasic CT than hypovascular lesions. Since clinical staging and surgical resectability guidelines depend on the precise accounting of the amount and position of tumor nodules, a biphasic study should be conducted regularly in patients suspected of having hypervascular lesions, such as hepatocellular carcinoma, and in patients scheduled for liver surgery.

CONCLUSION

The greatest diagnostic method for detecting liver lesions is biphasic computed tomography. While certain lesions do not exhibit any enhancement on the arterial, venous, or both stages, biphasic imaging improves the radiologist's visibility of the lesion. By the use of contrast enhanced images, it is often simpler to recognize and discern lesions.

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