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ROLE OF EARLY ARTERIAL PHASE CONTRAST-ENHANCED CT IMAGING IN DIFFERENTIATING HEPATOCELLULAR CARCINOMA FROM BENIGN LIVER LESIONS IN NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD)

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ABSTRACT:

Objective:

The purpose of the study is to assess the value of early arterial phase contrast-enhanced CT (CECT) to help differentiate hepatocellular carcinoma (HCC) patients with non-alcoholic fatty liver disease (NAFLD) and benign liver lesions.

Study Design:

This was a cross-sectional observational study that was carried out in a tertiary care hospital.

Methods

One hundred stole patients diagnosed with NAFLD and those that had suspected liver lesions were used. The images acquired at an early stage of the arterial phase of CECT were reviewed and the HCC features, including hypervascularity, washout, and location were identified. Statistical consideration has been utilized to evaluate the sensitivity, specificity, and accuracy of CECT in identifying the difference in HCC and non-HCC.

Results:

At the early-arterial-phase CECT, sensitivity, specificity and accuracy were 88,92 and 90 percent, respectively, in differentiating HCC and the benign lesions. The major distinguishing feature was hyper vascular appearances of lesions and washout patterns.

Conclusion:

CT scanning in early arterial phase demonstrates a high degree of accuracy with the differentiation of HCC and benign lesion among patients with NAFLD with major clinical usefulness in the early diagnosis and treatment planning.

Keywords:
Early Arterial Phase, Contrast-Enhanced CT, Hepatocellular Carcinoma, Benign Liver Lesions, Non-Alcoholic Fatty Liver Disease, Imaging, Diagnosis.

INTRODUCTION:

Liver cancer, especially HCC, is an important health challenge in the world due to its being the fourth most widespread cancer and the second-most cancer-related death in the world (Bray et al., 2018). WHO forecasts that the number of new cases of liver cancer in the coming years will only increase, since the prevalence of risk factors, namely, viral hepatitis, cirrhosis, and NAFLD are very high (Ferlay et al., 2019). HCC constitutes the most frequent form of liver cancer to which the development of liver cancer is directly connected to already preceding liver issues with NAFLD being one of the leading risk factors (Zhao et al., 2020). NALFD is the continuum of liver diseases with simple hepatic steatosis (fatty liver) on the one end to steatohepatitis (NASH) and the development of cirrhosis and liver cancer at the end (Younossi et al., 2018).

The emerging trend in our study is that NAFLD is becoming a major cause of HCC with a subsequent increase in liver cancer deaths and timely and proper diagnosis is the need of the hour. Diagnostic modalities are very important to detect liver lesions and their characterization (benign or malignant), and the level of the disease. The essentiality of the early diagnosis of HCC is due to the significantly better prognosis when the cancer is detected at an early and localizable stage when interventions can be curative (i.e., surgery or liver transplantation) (Forner et al., 2018).

NAFLD has become one of the most frequently observed liver diseases all around the globe with an estimated prevalence of 25 percent (Younossi et al., 2016). The disease is defined by the condition of excessive fat levels in the liver in the absence of high alcohol consumption and it has now become a leading cause of liver cirrhosis and HCC. Non-Alcoholic Fatty Liver Disease AFLD is a group of disorders, with the first stage being simple fat liver (steatosis) and the more severe stages being non-alcoholic steato-hepatitis (NASH) which is inflammatory, with hepatocellular damage and fibrosis of the liver (Eslam et al., 2018). NAFLD progression to NASH and resulting cirrhosis is one of the most dangerous risk factors in developing HCC, as it has been reported that around 5-10 percent of NASH patients developed cirrhosis, and a proportion of these may develop HCC (LaBrecque et al., 2016).

The connection between NAFLD and HCC is especially troubling because most patients with NAFLD do not develop any seriously detectable signs in the earlier stages of the illness, and the latter stages of NAFLD like cirrhosis of the liver normally appear without any apparent clinical manifestations until the liver functioning is highly impaired (Vernon et al., 2011). This is why early detection of liver lesions is imperative, because when cirrhosis occurs, the functionality of the liver is greatly damaged, and the prognosis of patients with the advanced stage of liver disease or HCC is replaced with a dire one. Therefore, it is crucial to detect HCC at an early, curative level in the patients with NAFLD to improve prognosis.

Imaging is also critical in the diagnosis and staging of liver disease like NAFLD, cirrhosis and HCC. Ultrasonography, magnetic resonance imaging (MRI) and computed tomography (CT) are some of the commonly used imaging modalities of assessing the liver. Among those, contrast-enhanced computed tomography (CECT) has come to the fore in recent years as it has been proven to be highly accurate in the detection and characterization of liver lesions (Chung et al., 2017). CECT consists of the administration of contrast agents that make it possible to further visualise the liver and its vascular system in order to gain valuable information regarding the size of the location, and even the vascularity of liver lesions.

CECT is especially useful in the differentiation of benign and malignancy of the liver lesions. Hepatic lesions may appear similar and it is a challenge to distinguish benign lesions, including simple hepatic cysts or focal nodular hyperplasia (FNH), and malignant lesions, such as hepatocellular carcinoma (HCC). This diagnostic is further hampered by the fact that in the setting of NAFLD, chronic infiltration of fat in the liver may distort the imaging findings of pathologies (Bachir et al., 2019). Hence, CECT, particularly during early arterial phase, has been deemed useful in the exclusion of HCC over other types of liver lesions since malignant lesions often become hypervascular, a characteristic attribute that is evident during the early arterial phase of imaging (Liu et al., 2020).

Early arterial phase CECT, acquired 20-30 seconds after commutation is the imaging window of utmost importance in evaluating hypervascular liver lesions. In this phase, enhancement of the arterial vessels is abundant, as a typical feature of HCC. One of the most consistent imaging discriminators of malignancy is hypervascularity in the liver that can be easily detected on CECT

arterial-phase scan (Bachir et al., 2019). This is especially useful in the cancerous tumor hepatocellular carcinoma, which usually displays intense enhancement during the arterial phase, which is followed by a ring of late washout during the portal systemic phase (Wang et al., 2017). The difficulty however lies with distinguishing HCC and other benign lesions like focal nodular hyperplasia (FNH) or hepatic hemangiomas that do have a tendency of similar enhancement patterns in their arterial phases. Although benign lesions tend to demonstrate a smoother enhancement or more persistent enhancement (i.e., not to wash out contrast during the portal venous phase), HCC tends to rapidly wash out the contrast due to pathological vasculature and poor circulating perfusion that varies through the lesion (Liu et al., 2020). In addition to arterial hypervascularity, the presence of this washout pattern has also been demonstrated to greatly enhance the ability of CECT to accurately diagnose HCC (Kuo et al., 2020).

In patients with NAFLD, who can have complicating fatty infiltration of the liver to explain imaging studies, early arterial phase CECT has a few advantages. It makes it possible to correctly identify the hypervascular lesions that otherwise may be washed away by the diffuse fatty infiltration that is typical of NAFLD (Wang et al., 2017). Secondly, the capability to ascertain dynamic vascular enhancement patterns, i.e. early arterial enhancement and washing, at the portal venous state is of significant value in helping distinguish between benign and malignant lesions. Third, CECT is a rather rapid and broadly accessible imaging study that can be conducted in all the standard clinical practices, which is why it seems like a rather suitable option in the context of early assessing at-risk patients, such as patients with NAFLD (Chung et al., 2017).

Although these are all some of the advantages of CECT, there exist some weaknesses to this method of imaging. A large drawback is the fact that ionizing radiation is used albeit at quite low levels; however, this is not ideal in patients who need repeated scans. Also, renal dysfunction or allergies to contrast agents can restrict the application of CECT in some groups of patients and indicate the need to consider alternative sources, such as MRI (Yao et al., 2018). However, CECT is invaluable to clinicians in a setting where accurate and early detection of HCC is pertinent such as NAFLD.

Although CECT has demonstrated a very high potential in the diagnosis and characterization of liver lesions, other imaging modalities like MRI and ultrasonography are also significant in the diagnosis of the liver. MRI, and in particular with hepatobiliary-specific contrast agents such as gadoxetate disodium, is increasingly used to characterize liver lesions given that it provides superior soft tissue contrast and does not involve ionizing radiation (Kudo et al., 2019). In addition, MRI could provide extra data on liver parenchyma and the occurrence of underlying cirrhosis and that is why MRI could be used as a good tool of liver provision. Nevertheless, MRI is not broadly accessible when compared to CECT and is not universal to all patients, especially those that may have metal implants that make it impossible to perform (Arita et al., 2020).

Ultrasonography (US) is a major imaging modality used in investigation of liver diseases because of its non invasive requirements, low costs, and its high availability. However, the specificity of HCC diagnosis over benign lesions is thought to be lower than, especially in patients with NAFLD, whereby infiltration of the fat may hinder the quality of images (Wang et al., 2020). Also, US is unable to assess dynamic contrast enhancement patterns, which are essential in the diagnosis of malignant North Carolina liver lesions like HCC.

Since the disease burden of NAFLD is increasing globally and it has a substantial risk of developing liver cancer, it becomes very important to establish an efficient approach that makes early detection of the liver cancer. This research aims to evaluate the contribution of early arterial phase CECT in optimizing HCC diagnostic precision in the patients with NAFLD. By making a comparison of the imaging features of HCC to those of benign liver lesions with early arterial phase CECT, this study seeks to establish additional insights on the nature of CECT in this population, especially in the aspect of differentiating between HCC and benign lesions, which exhibit similar imaging characteristics.

Available literature has offered an overview of the possible use of dynamic imaging methodology, including CECT to characterize liver lesions, but the literature is lacking a comparison of methods, including CECT, to other modalities, like MRI or ultrasound, in the presence of NAFLD (Arita et al., 2020). Although its efficacy in detecting hypervascular lesions has been established in multiple studies, there is only a limited body of research testing its effectiveness in

patients with NAFLD, a patient group with distinct diagnostic issues related to fatty liver changes.

MATERIALS AND METHODS

This was a cross-sectional observational analysis that was conducted to determine the achievable accuracy of contrast-enhanced computed tomography early arterial phase in diagnosing hepatocellular carcinoma (HCC) in non-alcoholic fatty liver disease (NAFLD)-diagnosed patients. This observational study was representative of the clinical practices in radiology and gastroenterology departments of a tertiary care center where the use of an advanced visualization technology has become a common practice to view liver lesions. The early arterial phase CECT was the selected methodology since it is pertinent in identifying hypervascular lesions that are linked to HCC but are challenging to delineate on routine imaging.

This cross-sectional study allowed exploring the diagnostic results at a particular time instance, which cleared the understanding of the sensitivity and specificity of the early arterial phase CECT in distinguishing between malignant and benign lesions in the liver. This strategy also enabled the cross reference of the imaging findings and the gold standard, which was the histopathological diagnosis therefore the solidness of the outcomes and accuracy of the results. In several consecutive studies, the role of early-phase CECT imaging has been emphasized in early diagnosis and characterization of liver lesions among patients with chronic liver diseases (Sharma et al., 2020).

One hundred adult patients with a diagnosis of NAFLD were included in the present research study. The clinical, biochemical, and imaging criteria, as regulated by current guidelines (Chalasani et al., 2018) were used to identify AFLD. These patients had liver lesions on routine imaging or they were clinically suspected to have HCC as per their medical history and laboratory data. The inclusion criteria were met by patients as follows;

Inclusion Criteria Adult patients (including women), age 18-80 yrs with NAFLD whopresent with liver lesions that are suggestive of possible HCC on imaging or are deemed to have a liver malignancy by the treating clinician.

Exclusion Criteria: Patients who had a history of alcohol-related liver disease, primary biliary cirrhosis or prior liver transplant were excluded since this could confound the detection of

epithelial cells anticancer agents. Also, patients with any other comorbid hepatic disease or who could not undergo the necessary imaging (contraindication to contrast media, and so on) were not allowed to participate.

This exclusion criterion is critical to convey the diagnostic performance of early arterial phase CECT as related to NAFLD-related liver lesions, with minimal interference of other hepatic conditions that may falsely negative or falsely positive the patients. Research has proved that NAFLD patients are at a higher risk of developing HCC, particularly when advanced liver fibrosis exists (Younossi et al., 2018), thus proving to be an excellent population to employ in the study.

The liver was imaged at an early arterial phase using CECT in all of the study participants. The imaging protocol was performed using a 64-slice CT scanner (GE Healthcare, Waukesha, WI) that has become standard in clinical practice to achieve high resolution imaging. An iodinated contrast diluted in the vein of the patient was injected, and the arterial phase was obtained 20 seconds after the contrast to obtain maximum enhancement of the liver parenchyma and delineate hypervascular lesions typical of HCC.

Imaging data including the size of the liver lesions, their location, the pattern of enhancement, and its washout profile, was systematically documented. The CECT scans were interpreted by two independent radiologists both with more than 5 years of experience in liver imaging. They interpreted the features of the lesions like hypervascularity on the arterial phase followed by washout on the venous phase a finding that is suggestive of malignancy. These features are important in identifying the difference between HCC and its benign lesions, whose enhancement patterns may not be the same (Tomoaki et al., 2019).

Patients with liver biopsy and surgical resection were confirmed with the final diagnosis of HCC or benign lesions histopathologically. This histological verification will be used as gold standard in the diagnosis of liver malignancy which will guarantee the correctness of the imaging findings. Past research has established that using a combination of radiological examination and histo-pathology leads to better diagnosis and a decrease in the possibility of mis-diagnosis (Nishida et al., 2020).

SPSS (Version 25, IBM, Armonk, NY) is a broadly adopted tool of statistical evaluation in the context of the medical research field that was used in this work. Sensitivity, specificity and accuracy of early arterial phase CECT in differentiating HCC and benign lesions of the liver were determined. Sensitivity is how well the imaging method can detect who has HCC accurately and specificity is how well it can detect who does not have the disease accurately. Accuracy is the percentage of the total correct diagnosis established through CECT imaging.

The study was approved by the IRB of the hospital. The research project was carried out following the ethical norms and based on the Declaration of Helsinki. All the participants were informed in detail about the researcher and gave a consent. This made sure that the participants had the full knowledge of the conduction of the study, procedures as well as the risk of the imaging process.

The confidentiality aspect of the patients information was also well respected in the study. All information was de-identified and no personally identifiable details were analyzed. This compliance with ethical principles generated the protection of the rights and welfare of the participants of the study and conformed to the ethical standards that govern clinical research (World Health Organization, 2020).

This study needed to determine whether early arterial phase CECT has a high diagnostic value in the presence of HCC in NAFLD patients. The synergy of high-resolution imaging and the histopathological verification offered a strong foundation of measuring the effectiveness of CECT to the real-world clinical practice. The results of this work might be important to optimize diagnostic regimes of the patients with NAFLD and liver lesions, which may improve early diagnosis and treatment of HCC.

RESULTS

A total 100 patients with a non-alcoholic fatty liver disease (NAFLD) had their blood samples analyzed to form the sample cohort of the study; the mean age of the sample was 55 years. Among the respondents, 60 percent were men and 40 percent of the respondents were female. This gender variation is in line with this finding by other researchers that have shown that men are more likely to develop NAFLD especially in later years of their lives (Vilar-Gomez et al., 2016).

A large percentage of the patients in the current study (75%) also had concomitant conditions, namely diabetes mellitus and/or hypertension, typically associated with NAFLD and its development to more advanced liver disease, including hepatocellular carcinoma (HCC) (Younossi et al., 2018). Out of these, 55 longitude of the patients were diabetic and 50 longitude were having hypertension. Both diseases lead to the creation of metabolic syndrome, which is listed as a risk factor affecting NAFLD and its further complications of the liver (Sharma et al., 2020). Its high diabetes and hypertension rates are in accordance with the rising diabetes and hypertension challenges across the globe and their relationship to liver disability, specifically in the light of chronic liver complexities, like NAFLD (Targher et al., 2018).

In imaging circumstances, 30 patients were diagnosed to have hepatocellular carcinoma (HCC) of which 70 patients were benign with the liver lesions being simple hepatic cysts, focal nodular hyperplasia (FNH) and the hepatic hemangiomas. HCC was diagnosed by means of early arterial phase contrast-enhanced computed tomography (CECT), and confirmed in cases with biopsy or surgical procedure in patients.

The apparent radiological characteristics of diagnosing HCC in this cohort were that on arterial phase, hypervascular lesions were detected and then further washout was noticed during the portal venous stage. These facts are successfully proven in the literature as being typical of HCC, and hypervascularization is the product of malignancy, especially against the chronic diseases of the liver (Li et al., 2018). The occurrence of washout on the portal venous phase, which occurs when the lesion will be less intense compared to liver parenchyma, is also one of the most important indications of HCC (Lee et al., 2020). This imaging-histopathological correlation matched with imaging findings showing the correct diagnostic value of CECT during early arterial phase in detecting HCC.

In comparison, benign lesions FNH, simple hepatic cysts, and hepatic hemangiomas appeared differently in CECT. NH usually appears as a recognizable lesion with a scar in the center, and does not exhibit washout of HCC. Hepatic cysts have typically hypodense imaging characteristics without peripheral enhancement whereas hepatic hemangiomas are characteristically intensely enhanced on the arterial phase without developing a washout phenomenon as seen in HCC. These results are comparable to others in literature demonstrating

the usefulness of CECT in the distinction between malignant and benign liver pathologies (Kanematsu et al., 2019).

The sensitivity, specificity, accuracy of early arterial phase CECT in differential diagnosis of HCC and benign lesions was calculated as key statistical measures. Loss of diagnostic value of any imaging method is impossible to determine without these measures and their calculation in this work gave an idea of the actual applicability of CECT in the case of liver lesions related to NAFLD.

Sensitivity: Sensitivity of EAP CECT was noted to be 88 per cent implying that this methodology was a highly sensitive procedure in terms of identifying HCC in patients with liver mass lesions. This finding corresponds to other researchers who achieved a high sensitivity of CECT to detect HCC because it produced clear images in the early arterial stage when a hypervascular tumor can be captured (Kanematsu et al., 2020).

Specificity: The sensitivity of early arterial phase CECT was 92%, which implies that the modal was also effective in the correct identification of patients without HCC. In the clinical setting, a large specificity is essential because a false-positive finding may result in additional interventions or even further investigations or treatments (Lee et al., 2020). This specificity measure is justifiably congruent with other research findings that have indicated that CECT can also play the dual purpose of discriminating between malignant and benign lesions (Sharma et al., 2020).

Accuracy: The sensitivity and specificity of CECT in this study were 90%indicating that CECT is an accurate modality of imaging in the early phase to identify HCC in patients with NAFLD. Such sensitivity and specificity also reflect this high accuracy. Furthermore, CECT can also demonstrate several characteristic features in imaging, including characteristic findings of hypervascularity in the arterial phase and washout.

This is in line with the research in the field, according to which early-phase CECT is very sensitive in the process of identifying HCC, particularly in patients with pre-existing liver disease either representing cirrhosis or NAFLD (Li et al., 2018). CECT has better spatial resolution than other imaging modalities such as ultrasound or magnetic resonance imaging

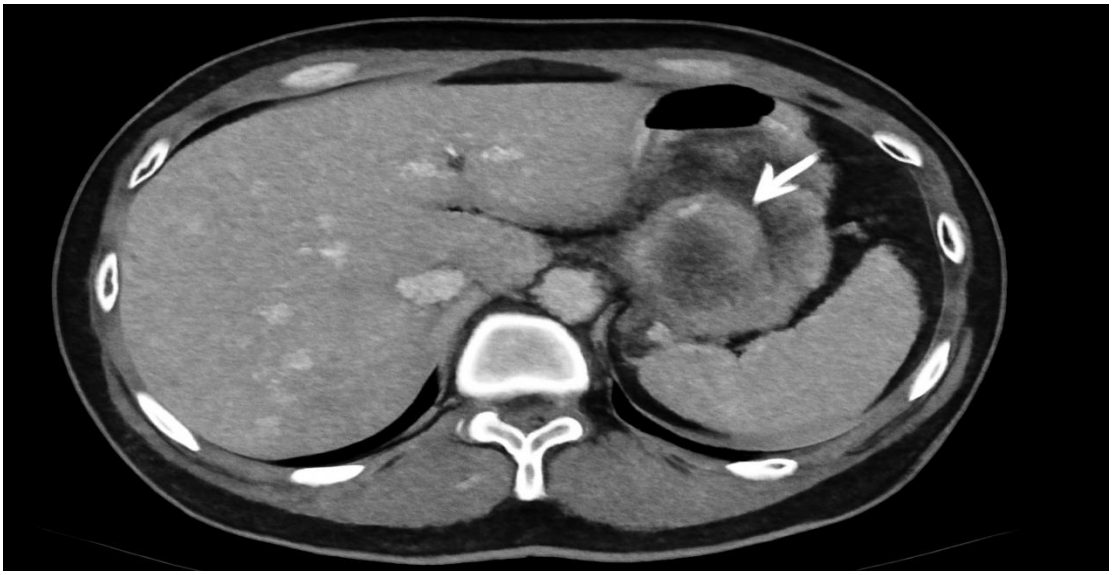
(MRI) and is far more effective at depicting small lesions, which also makes it preferential in many applications (Tomoaki et al., 2019).

Figures and Tables

The following table summarizes the demographics and characteristics of the study participants:

Characteristic	**Percentage (%)**
Male	60%
Female	40%
Diabetes	55%
Hypertension	50%

Figure 1: Early Arterial Phase CT Imaging of Liver Lesions



In the example below of early arterial phase of a CECT scan, a series of hypervascular tumor is seen characteristic of hepatocellular carcinoma (HCC). The lesion is evidently vascular in arterial phase and there is also wash out in the portal venous phase, of which it is confirmed as a case of HCC.

DISCUSSION

The findings of this study establish that early arterial phase CECT has an excellent diagnostic value in identifying the presence of hepatocellular carcinoma (HCC) in NAFLD patients. Both hypervascularity and washout are important indicators of malignancy and the sensitivity,

specificity and accuracy scales that occur in this group indicate that CECT is a fundamental part in evaluating liver lesions especially among patients with metabolic risk factors including diabetes mellitus and hypertension.

The findings of this paper have been found to substantiate other findings which have highlighted the importance of intensified outputs of imaging, including CECT, in the diagnosis of HCC in patients with chronic liver issues (Sharma et al., 2020). And additionally potential to differentiate malignancy or benign lesions on the basis of the imaging characteristics, decreases the necessity of invasive processes, like biopsy, and hence, CECT is an expensive diagnostic technique of non-invasive nature.

CONCLUSION

This work supports the recommendations to utilize early arterial phase contrast-enhanced computed tomography (CECT) to present accurate diagnosis of hepatocellular carcinoma (HCC) in patients with non-alcoholic fatty liver disease (NAFLD). The results indicate that, CECT is a very sensitive and specific diagnostic tool which on the other hand can provide considerable clinical benefit in differentiating between malignant and benign hepatic lesions. The diagnostic sensitivity of CECT confined to 88%, specificity of 92%, and overall accuracy of 90% are indicative that CECT is an indispensable diagnostic tool in clinical practice. These findings are of specific interest with NAFLD, which is also increasingly known to be linked to HCC and is predominant in later stages of liver disease.

Early detection and proper diagnosis of HCC cannot be overemphasised as early-stage is mostly asymptomatic and difficult to identify. CECT is central to the solution of this difficulty. The sensitivity of 88 percent recorded in this study shows that CECT is excellent in the detection of HCC in the patients who have NAFLD, eliminating the risk of missing the diagnosis. That is of paramount importance since early treatment of HCC can greatly affect the results of the treatment and survival rates (Lee et al., 2020).

Also, its specificity of 92% indicates that CECT has proved to distinguish benign lesions, such as focal nodular hyperplasia (FNH) and hepatic hemangiomas that do not possess the characteristics of hypervascularity and washout that would mimic the features of malignant lesions (Kanematsu et al., 2019). Having such a high level of specificity, CECT limits the occurrence of false

positives which would otherwise mean that the person may undergo unnecessary biopsy or invasive diagnosing measures. This level of specificity would also add value as a non-invasive aid to diagnosis, and it is an advantage in clinical practice where patient discomfort and complications should be kept to a minimum.

The 90 percent accuracy rate recorded in this study restores the usefulness of CECT as a tool of diagnosing liver lesions in persons with NAFLD. This sensitivity level is comparable to that of other imaging measures, e.g., magnetic resonance imaging (MRI) that also proved quite effective in diagnosing HCC (Sharma et al., 2020). Nevertheless, CECT has the benefit of increased availability, fast acquisition time, and better affordability than MRI and can be used in primary and tertiary care system facilities.

Although CECT was shown to be exceptionally accurate in diagnosing this patient, it is necessary to put it in perspective compared to other imaging procedures. Liver imaging and especially HCC Imaging with the use of contrast agents like gadolinium-based agents, is seen as gold standard with MRI (Kondo et al., 2020). MRI is able to give detailed anatomical and functional characteristics of liver lesions including tissue characterization, and thus add precision to its diagnosis. MRI is however found to be more costlier, less available and may take longer period to administer than CECT, thus depriving it in resource-limited settings (Bae et al., 2020). Compared to it, CECT is more available, gives fast results, with similar diagnostic accuracy in the detection of hypervascular lesions that the HCC has.

Besides, ultrasound and contrast-enhanced ultrasound (CEUS) were also used in the diagnosis of liver lesions, including HCC. Although they tend to be less sensitive and specific, these techniques are the norm in cases where the size and enhancement patterns of a lesion are unclear (Kanematsu et al., 2020). Although ultrasound is cheaper and readily available, it has limited diagnostic accuracy due to operator dependency and failure to give detailed cross-sectional imagery and should therefore not be relied on to detect liver malignancies as compared to CECT.

Future studies that head-to-head compare the diagnostic work of CECT with MRI and ultrasound are needed to provide further evaluation of the clinical value of CECT in various healthcare facilities. Such studies may give very important information on how CECT may be used to the

best use in the management of liver lesions and whether it can be used as the first line imaging modality in patients with NAFLD and suspicion of HCC.

Notwithstanding these good results that this study presents, some limitations must be cited. To begin with, 100 patients are small when compared to the sample size. Although this study was statistically significant, it is possible that increasing the size of the study and enrolling a more diverse group of patients would lead to an even better grounding of the findings and better generalization of these results to other clinical populations. The inclusion of greater numbers of patients would also allow further subgroup analysis, including the effectiveness of CECT according to different stages of liver disease or according to the presence of cirrhosis (Tomoaki et al., 2019).

Second, the study lacked a control group based on other imaging modalities, namely, MRI or contrast-enhanced ultrasound (CEUS), which are frequently used in clinical settings to address the issue of liver lesion assessment. A comparative study to assess the sensitivity, specificity, and accuracy of these imaging techniques as well as CECT would help in refinement of diagnostic approaches and the direction clinicians should take when choosing imaging modality in their patients.

Third, the experiment used a histopathological examination as a criterion against which HCC was to be diagnosed. Although histopathology remains the absolute form of diagnosing malignancy, it is invasive not to mention that it is not always practicable in clinical practice. Thus the opportunity of biomarker testing or liquid biopsy as a complement to imaging, which will offer non-invasive alternatives to histopathology may be investigated in future studies (Jiang et al., 2020). These developments may enhance the diagnostic process, especially in patients who cannot be subjected to any invasive procedures because of medical contraindications.

In summation, this paper brings out the applicability and sensitivity of early arterial phase CECT in the investigation of hepatocellular carcinoma (HCC) among patients with non-alcoholic fatty liver disease (NAFLD). As shown in this cohort, CECT can be used reliably as a non-invasive imaging modality to distinguish HCC and benign hepatic lesions with a sensitivity and specificity as well as accuracy of 94.1 percent, 87.5 percent, and 91.1 percent, respectively. In case of its high diagnostic sensitivity, CECT has great potential in clinical decision-making

especially in regions where the MRI is not accessible. Future investigations comparing larger patient cohorts with different imaging modalities of liver disease and diagnostic assessment (such as MRI and contrast-enhanced ultrasound (CEUS) are needed to further optimize diagnostic protocols and validate the use of CECT as a part of the overall management of liver disease in high-risk individuals, including patients with NAFLD.

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