ORIGINAL RESEARCH PAPER

Radiodiagnosis

TRIPHASIC MULTIDETECTOR COMPUTED TOMOGRAPHY IN DETECTION AND CHARACTERISATION OF SOLITARY LIVER LESIONS

KEY WORDS: Triphasic Multidetector Ct (mdct), Solitary Liver Lesions

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ABSTRACT

BACKGROUND :- Focal liver lesions are discrete abnormality arising within liver and are increasingly being discovered with the widespread use of diagnostic imaging modalities. Differentiation of various liver lesions is considered to be critical for determining the treatment options. Triphasic CT has become the primary imaging modality for detection and characterization of focal liver lesions. It is an effective aid in determining the number,location, and nature of such lesions and monitoring their size over time.

MATERIALS & METHODS :- This study was carried out on 40 cases diagnosed Chronic Liver Disease suspected to have solitary liver masses, from outpatient departments and indoor wards of various departments, in the department of Radiodiagnosis, Ims & Sum Hospital, Bhubaneswar from July 2015 to August 2017. Patients from both sexes and all ages were included as part of the study.

Results & Conclusions :- The combination of soft tissue characterization and anatomical localization afforded by CT allows radiologists to make a substantial contribution to the preoperative assessment of the patients with Solitary liver lesions.With triphasic multidetector CT (MDCT) there is tremendous improvement in scanning time, tissue resolution and quality of three dimensional (3D) reconstruction. MDCT has brought about newer applications like excellent quality Triphasic CT which will play significant role in solitary hepatic mass lesions. Radiological evaluation with cross sectional modalities, i.e. Triphasic ensures accurate anatomical localization, tumour morphology and state of surrounding structures in benign lesions. In malignant tumours, it is invaluable for staging and provides essential information about the tumour extent that directly affects the surgical approach necessary for curatives resection.

INTRODUCTION

Focal liver lesions are discrete abnormality arising within liver and are increasingly being discovered with the widespread use of diagnostic imaging modalities. Differentiation of various liver lesions is considered to be critical for determining the treatment options. [1] The differential diagnosis (malignant and non malignant lesions) in patients presenting with a focal liver lesion is broad. The high frequency of benign focal liver lesions such as Cysts, Hemangiomas, and Focal nodular hyperplasia etc. should be detected and characterization of these lesions essential. [2] In addition, in many of the patients who are referred for CT, one does not know which of these liver abnormalities will be present. Consequently, the preferred liver imaging technique should comprise high sensitivity & specificity for lesion detection with good ability for lesion characterization and to differentiate lesions that do need further diagnostic tests/treatment from those lesions that do not.[3]

To meet these requirements, a CT protocol was developed to image the entire liver in arterial, portal, and equilibrium (venous) phases.[4]

Triphasic CT has become the primary imaging modality for detection and characterization of focal liver lesions. It is an effective aid in determining the number,location, and nature of such lesions and monitoring their size over time.[5] In patients with cancer, the accurate detection of metastatic disease at the time of diagnosis or during the course of treatment remains crucial to management of the disease. CT has assumed primary role in evaluating hepatic masses. [6] Despite increased competition from MRI over last decade, role of diagnosis of diseases of liver has not been significantly affected. Besides the general availability of the method, the dominance of CT is primarily due to its excellent visualization of anatomic relationship of liver position relative to adjacent organs. .[7,8]

This study is an effort to assess the role of Triphasic MDCT in detection and characterization of focal liver lesions and help in deciding further course of management.[9]

AIMS AND OBJECTIVES

To evaluate the usefulness of Triphasic Multidetector Computerized Tomography in detection and characterization of focal liver lesions and provide information that could accurately determine the further choice of management and to correlate imaging findings with histopathology were ever necessary

MATERIALS AND METHODS

This study was carried out on 40 cases of clinically diagnosed neck masses, in the department of Radiodiagnosis, Ims & Sum Hospital, Bhubaneswar from July 2015 to August 2017. All the patients were selected from outpatient departments and indoor wards of various departments(mostly from Gastro department). Patients from both sexes and all ages were included as part of the study.

1. Inclusion criteria - All cases who are advised Triphasic MDCT scan.

- **EXCLUSION CRITERIA:**

1. All post operative cases.
2. Claustrophobic patients.
3. Patients with history of hypersensitivity to contrast agents.
4. Patients with existing renal diseases
5. Patients with severe acute illness.

Preparation Of Patient - After taking proper history, clinical examination and laboratory investigations, the patient is prepared for CT scanning. Past history including previous treatment history and drug history is taken.Before performing the scan, the procedure and objective of performing the scan is explained to the patient and the attendants.

Informed consent of patients/attendant is taken for IV contrast examination. Non-ionic iodinated contrast, dose depending on body weight is given as rapid IV bolus by hand injection. The patient is kept on empty stomach for 4-6 hours prior to performing the scan.

CT Imaging Protocol - For CT imaging, patients were scanned in the supine position on the scanner gantry .When possible patients are scanned with quiet breathing and swallowing suspended. Contiguous 5mm thick axial images were obtained from the level of lung apices to Pelvis. CT equipment used is GE 660 OPTIMA 128 SLICE.

POST PROCESSING – Multiplanar reforming (both coronal and saggital planes) were done whenever necessary. All images reconstructed with bone algorithm to detect bone and cartilage invasion.

DISCUSSION

The conspicuity of a liver lesion depends on the attenuation difference between the lesion and the normal liver. On a non enhanced CT-scan (NECT) liver tumors usually are not visible, because the inherent contrast between tumor tissue and the surrounding liver parenchyma is too low. Only a minority of tumors contain calcifications, cystic components, fat or hemorrage and will be detected on a NECT. So i.v. contrast is needed to increase the conspicuity of lesions.When we give i.v. contrast, it is important to understand, that there is a dual blood supply to the liver. Normal parenchyma is supplied for 80% by the portal vein and only for 20% by the hepatic artery, so it will enhance in the portal venous phase.All liver tumors however get 100% of their blood supply from the hepatic artery, so when they enhance it will be in the arterial phase.

This difference in bloodsupply results in different enhancement patterns between liver tumors and normal liver parenchyma in the various phases of contrast enhancement. In the arterial phase hypervascular tumors will enhance via the hepatic artery, when normal liver parenchyma does not yet enhances, because contrast is not yet in the portal venous system. These hypervascular tumors will be visible as hyperdense lesions in a relatively hypodense liver.However when the surrounding liver parenchyma starts to enhance in the portal venous phase, these hypervascular lesion may become obscured.In the portal venous phase hypovascular tumors are detected, when the normal liver parenchyma enhances maximally.

These hypovascular tumors will be visible as hypodense lesions in a relatively hyperdense liver.In the equilibrium phase at about 10 minutes after contrast injection, tumors become visible, that either loose their contrast slower than normal liver, or wash out their contrast faster than normal liver parenchyma.

These lesions will become either relatively hyperdense or hypodense to the normal liver. This phase can be valuable if you're looking for: fast tumor washout in hypervascular tumors like HCC or retention of contrast in the blood pool as in hemangiomas or the retention of contrast in fibrous tissue in capsules (HCC) or scar tissue (FNH, Cholangioca).

Value of Equilbrium Phase	
Tumoral wash out	Vascular tumors
Retention of contrast in blood pool	Hemangioma
Retention of contrast in fibrous tissue	Capsule around HCC Cholangiocarcinoma when fibrous Central fibrous scar (FNH)

If the lesion is of near water density, homogeneous, has sharp margins and shows no enhancement, then it is a cyst. If the lesion does enhance, then the next step is to determine whether the lesion could be a hemangioma, since this is by far the most common liver tumor. The enhancement should be peripheral and nodular, with the same density as the bloodpool in all phases. If it is not a cyst nor a hemangioma, then we further have to study the lesion. Based on the enhancement pattern, we divide masses into hypervascular and hypovascular lesions.

Usually a combination of the enhancement pattern and gross pathologic features, like the presence of fat, blood, calcifications, cystic or fibrotic components, in combination with the clinical history will limit the differential diagnosis.

	Scar	Capsul	Ca^{++}	Fat	Blood	Cystic
Hemangioma	+		+		+	
FNH	+			+		
Adenoma		+		+	+	
HepatoCellCa	+	+		+	+	+
FibrolamellCa	+		+			
CholangioCa	+		+			
Metastases			+		+	+
Abces						+
Angiosarcoma					+	
Cystadenoma		+				+
Angiomyolipoma				+		

SUMMARY AND CONCLUSION

SUMMARY

This was a study carried out on 40 patients of both sexes and all ages in the Department of Radiodiagnosis, IMS & SUM HOSPITAL, Bhubaneswar over a duration of 2 years. Both clinically benign as well as malignant Solitary Liver lesions in patients from various departments were included as part of the study. Aim of the study was to assess role of Triphasic Multidetector CT in detection & characterisation of solitary liver lesions. Throughout the study there was an endeavour to provide information that will directly affect treatment and care of patients with Solitary liver masses. Cytopathologic, histopathologic and operative correlation was done in all possible cases. The relevant Patho-physiology were discussed briefly in relation to chronic liver disease . After taking proper history, clinical examination and laboratory investigations, Triphasic CT scanning was performed spiral CT scanner (GE 660 OPTIMA 128 SLICE). Review of the study group comprising of 40 patients of both sexes reveal that Hepatocellular carcinoma & Haemangioma form the predominant group with 14 cases (35%) each. Intrahepatic CholangioCa comprised 17.5%, while simple hepatic cyst and hepatic abscess had a similar incidence. Infectious origin masses had a 5% incidence. Miscellaneous masses including Focal nodular hyperplasia,Hepatic adenoma etc constituted approximately 20%. The highest number of cases was seen in the 51-60years age group.

CONCLUSION

The combination of soft tissue characterization and anatomical localization afforded by CT allows radiologists to make a substantial contribution to the preoperative assessment of the patients with Solitary liver lesions.With triphasic multidetector CT (MDCT) there is tremendous improvement in scanning time, tissue resolution and quality of three dimensional (3D) reconstruction. MDCT has brought about newer applications like excellent quality Triphasic CT which will play significant role in solitary hepatic mass lesions. Radiological evaluation with cross sectional modalities, i.e. Triphasic ensures accurate anatomical localization, tumour morphology and state of surrounding structures in benign lesions. In malignant tumours, it is invaluable for staging and provides essential information about the tumour extent that directly affects the surgical approach necessary for curatives resection.

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