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COMPARATIVE STUDY OF FOCAL LIVER LESIONS ON CECT AND 3T MRI.

Radio-Diagnosis

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ABSTRACT

Background: Focal liver disease is a common diagnostic problem referred to radiologists for evaluation owing to its nonspecific clinical presentation [1]. The first line of investigation is ultrasonography. Since ultrasonography is less specific, better modes of investigation are needed for better characterization and hence diagnosis of FLLs. The available options are computed tomography (CT) and magnetic resonance imaging (MRI) [5]. It is important to characterize these lesions to determine their nature and thus, plan further management. **Material & methods:** This is a prospective observational study performed in tertiary care hospital during year 2021-22 which had 54 patients referred for CECT and MRI Abdomen & Pelvis scans to department of radiology with diagnosed or suspected focal liver lesions or deranged liver function tests (LFTs). These patients were evaluated on a 128 slice CT scanner and 3T MRI scanner. **Results:** In this study 51.9% cases were benign and 48.1% were malignant. Of the benign cases, 50% cases were abscesses followed by hydatid disease, haemangioma, biliary cystadenoma, simple cyst and hepatic adenoma as 17.8%, 17.8%, 7.1%, 3.5% and 3.5% respectively and of the malignant cases, 65.3% cases were metastasis followed by HCC, IHCC, spindle cell neoplasm and lymphoma as 19.2%, 7.7%, 3.8% and 3.8% respectively. While CECT correctly diagnosed 43 cases, MRI was able to diagnose 45 cases correctly. **Conclusion:** 1) CECT and MRI were found to be comparable and highly accurate in the diagnoses of FLLs. However, CECT performed better for abscesses whereas MRI was better for metastatic lesions. 2) DWI sequence was found to be of great importance in the diagnosis of not only smaller lesions, but also helped in the distinction of malignant lesions from benign. 3) Contrast administration was found to be invaluable in the confident characterization of FLLs both with CT and MRI.

KEYWORDS

FLL – focal liver lesion, CECT – contrast enhanced CT, MRI – magnetic resonance imaging, DWI – diffusion weighted imaging, HCC – hepatocellular carcinoma, IHCC – intrahepatic cholangiocarcinoma

INTRODUCTION:

Focal liver lesions (FLLs) are fairly common in the general population and frequently found during ultrasonography either incidentally in healthy subjects, in symptomatic patients or in patients with oncological history, during cancer staging or follow-up [2]. Liver biopsy, considered the current gold standard, allows examination of only 0.002% of the liver parenchyma, carries significant bleeding risk and there is great intra and inter-observer variability so much so that some even argue that is not a true gold standard [3,4].

Sonography is versatile, non-invasive and inexpensive screening modality but it is less specific and is heavily operator dependant. Since it is very subjective, better modes of investigation are required i.e. cross sectional imaging modalities – CT and MRI.

CT has for long been the modality of choice for evaluation of FLLs allowing acquisition of thin slices with isotropic voxel size resulting in less partial volume averaging, superior quality, true isotropic, three dimensional, multiplanar reconstructions (MPR) thus improving the detection of smaller subcapsular lesions, can show the feeding arteries and venous drainage of these lesions, or help in the characterization of lesions by better demonstrating their enhancement patterns [5,6]. The important advantages offered by contrast enhanced CT scans are that they are widely and more easily available, faster acquisition and cheaper when compared to MRI.

MRI offers major advantages due to its high contrast resolution, multiplanar capability, sensitivity to blood flow and lack of ionizing radiation. It has evolved into an important problem solving technique for liver lesions. Also, with the advent of spectroscopic studies, tissue characterization can further be detailed narrowing down the possible differentials. The downside to MRI is that the scans are time consuming, more expensive and may not be as widely available when compared to CT and image quality may be compromised in patients with difficulty in breath-holding due to any reason [7].

With above background, this study has been taken up to analyze the diagnostic value of CT and MRI examinations for focal liver lesions.

AIMS AND OBJECTIVES

AIM: To Compare Focal Liver Lesions On CECT and 3T MRI.

OBJECTIVES:

1. To study and compare the diagnostic efficacy of CECT and MRI in the imaging of focal liver lesions and to confirm the same with histopathological examination
2. To study the imaging characteristics of focal liver lesions on contrast enhanced computed tomography and magnetic resonance imaging.

MATERIAL AND METHDOS

This is prospective observational study performed in tertiary care hospital during year 2021-22, which had 54 patients who were referred for CECT and MRI Abdomen & Pelvis to the department of radiology from any department of the tertiary health care centre with diagnosed or suspected focal liver lesions or deranged LFTs. All these patients were studied on 128 slice Seimens Somatom Definition AS machine and MRI scan was done on 3.0T GE Discovery 750W machine.

For contrast enhanced CT scan, an antero-posterior (AP) digital scanogram/scout image was obtained from the lower end of diaphragm up to pelvis. Non-enhanced 5mm and 1mm scans were obtained. Thereafter, contrast was injected by injecting Inj. Iohexol 350mg/100cc (by applying 1.5ml/kg formula for contrast volume calculation) intravenously using a pressure injector. Triple phase CT was then performed taking arterial, portal venous and delayed scans at 25-30 seconds, 60-70 seconds and 3-5 minutes time respectively. Multiplanar reconstruction (sagittal and coronal) was performed in post processing. All scans were stored in the memory and were reviewed on console.

For MRI scans, a survey scout was performed for planning. After planning, at least the following sequences were obtained:

- Axial T1W Gradient Echo (GRE) in-phase and out of phase
- Axial T2W Turbo Spin Echo (TSE)
- Diffusion weighted single shot spin echoplanar imaging (SS SE EPI)
- Need for additional sequences like MR spectroscopy and contrast administration were decided on the basis of imaging pattern of the lesion on the above sequences.

After imaging data was collected & analysed for the observations & results.

OBSERVATIONS AND RESULTS

1. In this study, majority of the cases were benign i.e 28 (51.9%)

where as there were 26 (48.1%) malignant cases.
2. Majority of the benign cases were abscesses i.e 14 (50%) followed by hydatid disease, haemangioma, biliary cystadenoma, simple cyst and hepatic adenoma as 5 (17.8%), 5 (17.8%), 2 (7.1%), 1 (3.5%) and 1 (3.5%) respectively.
3. Majority of the malignant lesions were metastases i.e 17 (65.3%) followed by HCC, IHCC, spindle cell neoplasm and lymphoma as 5 (19.2%), 2 (7.7%), 1 (3.8%) and 1 (3.8%) respectively.
4. Out of a total of 28 benign lesions, CECT was able to correctly diagnose 25 lesions, whereas MRI was able to correctly identify 24 lesions.
5. Out of a total of 26 malignant lesions, CECT was able to correctly identify 18 lesions, whereas MRI was able to correctly diagnose 19 lesions.
6. In the characterisation of lesions on CECT, well defined margins was an imaging indicator whereas heterogenous enhancement and ill-defined margins were indicators to identify malignant lesions.
7. In the characterization of lesions on MRI, well defined margins with homogenous enhancement and no restriction of diffusion were indicators for benign lesions whereas poorly defined margins, heterogenous contrast enhancement, T2W intermediate intensity and restricted diffusion were indicators of malignant lesions.
8. Benign lesions were found more in the younger age group and in the female gender whereas the malignant lesions were commoner in the older age groups and had a male predominance.
9. CECT and MRI were found to be comparable for most of the cases except in cases of abscesses where CECT performed better than MRI and metastases where MRI performed better than CECT.

Table 1 : Detection of Benign lesions on CECT and MRI (n=28), (D = detected, ND = not detected, DE = diagnostic efficacy)

Lesion	Frequency	CECT			MRI		
		D	ND	DE	D	ND	DE
Simple cyst	1	1	0	100%	1	0	100%
Hydatid disease	5	4	1	80%	5	0	100%
Biliary cystadenoma	2	2	0	100%	2	0	100%
Haemangioma	5	4	1	80%	4	1	80%
Adenoma	1	1	0	100%	1	0	100%
Abscess	14	13	1	92.8%	11	3	78.5%

Table 2 : Detection of Malignant lesions on CECT and MRI (n=26), (D = detected, ND = not detected, DE = diagnostic efficacy)

Lesion	Frequency	CECT			MRI		
		D	ND	DE	D	ND	DE
Metastases	17	13	4	76.4%	16	1	94.1%
HCC	5	3	2	60%	3	2	60%
IHCC	2	1	1	50%	1	1	50%
Spindle cell neoplasm	1	0	1	0%	0	1	0%
Lymphoma	1	1	0	100%	1	0	100%

DISCUSSION

- **Semelka, R.C. *et al.* (1992) [13]** found that CT and MRI both were excellent in identifying simple cysts with MRI being slightly better when contrast was used, however not significantly better. Similar results were observed in our study.
- **Margolis N. et al (2013) [12]** found that MRI was better than CECT for diagnosis of biliary cystadenoma. However, in our study, both modalities performed equally.
- **Semelka, R.C. *et al.* (1992) [13]** found that enhanced MRI was the most superior method with almost 100% detection rate followed by CECT. Non-enhanced MRI performed significantly poorly. Our study findings correlated with these findings.
- **Margolis N. et al (2013) [12]** found that CECT was only marginally better than MRI in detection of hydatid cysts, not significant. Our study also correlated with this.
- **Semelka, R.C. *et al.* (1992) [13]** found that enhanced CT and MRI both were equally and always diagnostic. Our study findings for abscesses correlated with this.
- **Semelka, R.C. *et al.* (1992) [13]** found that enhanced CT and MRI both diagnosed adenomas with a 100% confidence and the same was assessed in our study.
- **Chezmar, J.L. *et al.* (1988) [14]** found that CECT was better than MRI; **Rummeny, E.J. *et al.* (1992) [19]** found that MRI, specially T2WI to be far superior than dynamic CT, **Senéterre, E. *et al.* (1996) [10]** found that enhanced MRI was better than non-enhanced MRI and CECT both. Our study findings also found that MRI diagnosed metastases in more cases than CECT and the use of contrast in MRI improved confidence.
- **Semelka, R.C. *et al.* (1992) [13]** found that enhanced MRI was better than unenhanced MRI which was better than CECT; **Ichikawa, T. *et al.* (2010) [11]** found that enhanced MRI and CT were almost equally and better than unenhanced MRI; **Sersté, T. *et al.* (2012) [8]** found that MRI was significantly better than CECT for smaller HCCs and dysplastic nodules. In our study, we found MRI and CECT to be comparable.

CONCLUSION

1. CECT and MRI were found to be comparable and highly accurate in the diagnosis of focal liver lesions in most of the cases. However, CECT performed better for abscesses whereas MRI performed better in case of metastatic lesions.
2. Contrast administration was found to be invaluable in the accurate and confident diagnosis of focal liver lesions both in CT and MRI.
3. T2WI sequence was found to be extremely important in the identification of lesions.
4. DWI was found to be of great importance in the diagnosis of not only smaller lesions, but it also helped in the distinction of malignant lesions from benign lesions.

Images

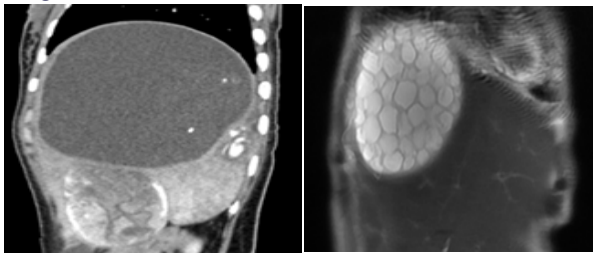

Image 1: Sagittal reformat CECT showing three different stages of hydatid disease. Image 2: Corresponding sagittal T2W image showing multiple daughter cysts.

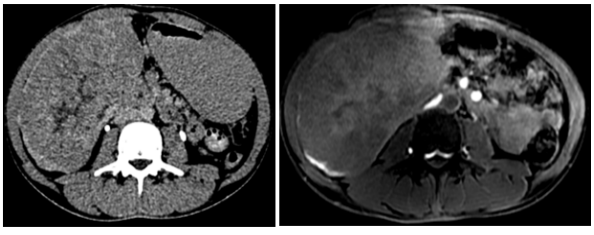

Image 3 : Delayed post-contrast CECT imaaging showing minimal enhancement of the central scar. Image 4 : Corresponding delayed post-contrast axial T1W imaging showing minimal scar enhancement. This lesion turned out to be Spindle cell carcinoma.

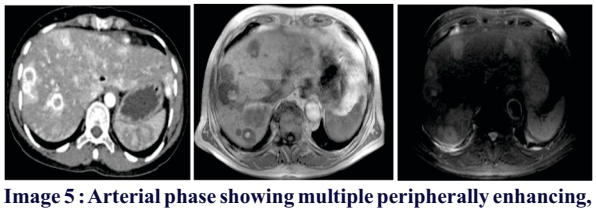

Image 5 : Arterial phase showing multiple peripherally enhancing, centrally necrotic lesions. Images 6, 7 : Corresponding T1W and T2W imaging in the same patients. These lesions turned out to be hypervascular metastases from known RCC.

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