ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

Original Research Article

TO ASSESS FEATURES OF BENIGN AND MALIGNANT FOCAL LIVER LESIONS IN DCE-MRI

Dr. Akanksha Malviya[1]

[1]Consultant Radiologist, Apollo Spectra Hospital, Gwalior, M.P, India.

Corresponding Author:
Dr. Akanksha Malviya, Consultant Radiologist, Apollo Spectra Hospital, Gwalior, M.P, India.

Abstract

Background & Methods: The aim of the study is to assess the role of DCE-MRI in characterizing the liver lesions into the various types. The patient was then placed on the gantry table in supine position with arms placed above the head. Patient was explained to hold his/her breath on verbal instruction and to resume breathing on reinstruction. In case patient was dyspneic or was unable to hold breath for reasonably long time, he/she was advised to maintain shallow breathing.

Results: The most common age group among our study was between 40-49 years. Pain was the most common presenting complaint, and 36 % patients had a previous history of malignancy. 50 lesions were diagnosed as benign on MRI, while 44 being malignant. Peripheral nodular enhancement with delayed filling in was the most common enhancement characteristic seen in Hemangiomas, while rapid arterial phase enhancement with rapid washout was most commonly seen in HCC's, heterogeneous enhancement was most common for metastatic lesions

Conclusion: Liver lesions are very common, ranging from benign solitary lesion to multiple liver metastases. Histopathological examination makes the definitive diagnosis but DCE-MRI is highly effective tool in making the diagnosis non-invasively and help in planning the treatment of patient. It helps in differentiating between pseudo tumors lesions like focal fatty infiltration, infection (abscess, hydatid cyst etc.) & inflammatory disorders of liver and tumors. It can characterize tumors into benign and malignant lesions and can be also utilized for differential diagnosis in complicated cases.

Keywords: DCE-MRI, characterizing, liver & lesions.

Study Design: Observational Study.

1. INTRODUCTION

MRI is a competitive modality for assessing the morphology and functional characteristics of the liver in cases of diffuse and focal liver disease. Technical improvements, such as the development of more powerful gradient systems and phased-array body coils, as well as the implementation of advanced imaging sequence designs, such as respiratory-triggered three-dimensional data acquisition and sparse k-space sampling schemes, permit high-quality examination of the liver[1].

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

On noncontrast-enhanced pulse sequences, physiologic liver parenchyma shows a higher T1 signal intensity and a lower T2 signal intensity compared with the spleen. On diffusion weighted sequences, the liver appears hypointense compared to the spleen due to the relative restriction of diffusion of water molecules in the spleen. Chemical fat-saturation sequences and gradient-recalled echo (GRE) sequences with out-of-phase and in-phase image acquisitions are helpful for assessing hepatic or intralesional steatosis.

A dynamic study provides additional information about lesion vascular enhancement, which may represent the only clue for the differential diagnosis between premalignant and malignant lesions. In addition, the introduction of hepatobiliary contrast agents has further implemented the diagnostic confidence of the technique, permitting to explore the so-called grey area in which significant histological changes are already present without an evident arterial supply of the nodule[2]. Magnetic resonance imaging in combination with liver-specific contrast agents, including hepatocyte-targeted and reticuloendothelial system-targeted agents, may be useful to clarify questionable cases, due to its ability to show changes in hepatobiliary function or Kuppfer cell content associated with malignancy.

Three hepatic fissures help define the margins of the hepatic lobes and the major hepatic segments. The interlobar fissure is an incomplete structure on the inferior margin of the liver that is oriented along a line passing through the gall bladder fossa inferiorly and the middle hepatic vein superiorly[3]. The interlobar fissure forms the inferior margin of the border between the right and left hepatic lobes.

The liver receives around 20% of the cardiac output. The afferent vessels of the liver are the hepatic arteries and the portal veins which enter the liver at the hilum (porta hepatis). They are accompanied by corresponding branches of the bile duct with which they form the portal triads. The hepatic veins are the efferent vessels of the liver. They drain directly to the IVC[4].

2. MATERIAL AND METHODS

This prospective study was done in the Department of Radio diagnosis of Mahatma Gandhi Memorial Medical College & M.Y. Hospital, Indore for 01 Year. A total of 100 patients who were referred to our department with strong clinical suspicion of focal liver lesion and those diagnosed by ultrasonography or multiphasic contrast enhanced CT underwent Dynamic contrast enhanced Magnetic Resonance Imaging evaluation of abdomen using 1.5 T 8 channel MRI scanner.

Inclusion criteria

1. Patients already diagnosed with focal liver lesion by ultrasonography.
2. Patients with equivocal findings on contrast enhanced CT examinations.
3. Patients with strong clinical suspicion of focal liver disease, or extra hepatic malignancy elsewhere in the body.

Exclusion criteria

1. Patients with mass lesions infiltrating the liver from outside the liver.
2. Patients with traumatic injury to liver.
3. Patients with general contraindication to MRI such as those with pacemakers, cochlear implants and other electromagnetic implants in body.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

3. RESULT

Table 1: Age Distribution

S. No.	AGE (YEARS)	NO OF CASES	PERCENTAGE
1	0 – 9	02	2%
2	10 -19	03	3%
3	20-29	10	10%
4	30-39	23	23%
5	40-49	29	29%
6	50-59	20	20%
7	60-69	07	7%
8	70-79	03	3%
9	Above 80	03	3%
	TOTAL	55	100%

The most common age group among our study was between 40-49 years.

Table 2: Presenting Complaint

S. No.	COMPLAINTS	NO OF CASES	% OF CASES
1	PAIN	48	48%
2	H/O MALIGNANCY	37	37%
3	MASS ABDOMEN	24	24%
4	INCIDENTAL	32	32%
5	JAUNDICE	28	28%
6	FEVER	10	20%
7	ASCITES	26	26%

Pain was the most common presenting complaint, and 36 % patients had a previous history of malignancy.

Table 3: Liver Parenchyma on USG

S.NO	PARENCHYMA	NO. OF CASES	% OF CASES
1.	CIRRHOTIC	33	33%
2	NON-CIRRHOTIC	67	67%
	TOTAL	100	100%

On USG 33 cases were diagnosed as cirrhotic

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

Table 4: Liver Parenchyma on MDCT

S.NO	PARENCHYMA	NO. OF CASES	% OF CASES
1.	CIRRHOTIC	39	39 %
2	NON-CIRRHOTIC	61	61%
	TOTAL	55	100%

39 cases were diagnosed with cirrhosis on MDCT.

Table 5: MRI Findings

S. No.	TYPE OF LESION	No. OF LESIONS	% OF LESION	P Value
1	INFLAMMATORY	06	6%	.034369
2	BENIGN	50	50%	
3	MALIGNANT	44	44%	
	TOTAL	100	100%	

50 lesions were diagnosed as benign on MRI, while 44 being malignant. The chi-square statistic is 2.1739. The *p*-value is .034369. The result is significant at $p < .05$.

Table 6: Contrast Enhancement Characteristics:

	PATTERN OF ENHANCEMENT	NO. OF LESIONS	% OF LESIONS
1.	ARTERIAL WITH RAPID WASHOUT	10	10%
2	PERIPHERAL WASHOUT	18	18%
3.	DELAYED FILLING IN	29	29%
4.	RING LIKE	09	9%
5.	DELAYED WITH CENTRAL RETENTION	02	2%
6.	HOMOGENOUS	02	2%
7	HETEROGENOUES	30	30%

Peripheral nodular enhancement with delayed filling in was the most common enhancement characteristic seen in Hemangiomas, while rapid arterial phase enhancement with rapid washout was most commonly seen in HCC's, heterogeneous enhancement was most common for metastatic lesions

4. DISCUSSION

The hepatic adenoma findings are various, with in-phase T1-weighted images showing hyperintensity or isointensity and T2-weighted images showing hypointensity to hyperintensity with lobulated well defined margins. In fat containing tumors , opposed- phase T1-weighted images show a decreased signal . Hemorrhagic tumors show hyperintensity on T1-weighted

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

images and marked hyperintensity on T2-weighted images. On DCE imaging shows rapid post contrast enhancement in the arterial phase, and becomes iso-intense to the liver parenchyma on delayed phases. Similar findings were described by Graziioli et al[5], and Koh et al[6].
DCE- MRI was accurate in differentiating between benign lesions such as hemangioma , hepatic adenoma and FNH providing accurate information about the morphological and functional information of the lesions as also observerd by Grazioli et al23. 3 lesions were wrongly diagnosed as malignant on the MRI, which on follow up turned out to be benign lesions. Among those one was an abscess showing ring enhancement and internal hemorrhage diagnosed as a metastasis, while one was a atypical hemangioma which was showing solid arterial enhancement in a patient with pelvic sarcoma.
Metastatic liver cancer appears hypointense on T1-weighted images and hyperintense on T2-weighted images. Necrotic changes in the central portion are depicted as more hyperintense on T2-weighted images, and a bull's-eye pattern may be seen. In liver metastases from colon cancer, T2-weighted images may show the center to be hypointense due to fibrosis. Because melanin is a paramagnetic substance, liver metastases from melanoma typically appear hyperintense on T1-weighted images and hypointense on T2-weighted images. The contrast imaging patterns of metastasis depends on whether its hypervascular as in cases of those from thyroid, breast, carcinoids which show rapid arterial phase enhancement or hypovascular as in cases of those from colon, lung, prostate which show delayed phase enhancement. In case of cystic metastasis, it has a ring enhancement pattern as described by Elsayo et al[7], Hamm et al[8].

5. CONCLUSION

Liver lesions are very common, ranging from benign solitary lesion to multiple liver metastases. Histopathological examination makes the definitive diagnosis but DCE-MRI is highly effective tool in making the diagnosis non-invasively and help in planning the treatment of patient. It helps in differentiating between pseudo tumors lesions like focal fatty infiltration, infection (abscess, hydatid cyst etc.) & inflammatory disorders of liver and tumors. It can characterize tumors into benign and malignant lesions and can be also utilized for differential diagnosis in complicated cases.

6. REFERENCES

1. Alvin C. Silva, James M. Evans, Ann E. McCullough, Mashal A. Jatoi, Hugo E. Vargas, Amy K. Hara. MR Imaging of Hypervascular Liver Masses: A Review of Current Techniques.RadioGraphics 2009 29:2, 385-402.
2. Khaled M. Elsayes, Vamsidhar R. Narra, Yuming Yin, Govind Mukundan, Markus Lammle, and Jeffrey J. Brown. Focal Hepatic Lesions: Diagnostic Value of Enhancement Pattern Approach with Contrast-enhanced 3D Gradient-Echo MR Imaging. RadioGraphics 2005 25:5, 1299-1320.
3. Faisal Khosa, Atif N. Khan, and Ronald L. Eisenberg. Hypervascular Liver Lesions on MRI.American.Journal of Roentgenology 2011 197:2, W204-W220.
4. Shahid M. Hussain, Türkan Terkivatan, Pieter E. Zondervan, Esmée Lanjouw, Sjoerd de Rave, Jan N. M. IJzermans, Rob A. de Man. Focal Nodular Hyperplasia: Findings at State-of-the-Art MR Imaging, US, CT, and Pathologic Analysis.RadioGraphics 2004 24:1, 3-17.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE1, 2024

5. Grazioli L1, Morana G, Kirchin MA, Schneider G. Accurate differentiation of focal nodular hyperplasia from hepatic adenoma at gadobenate dimeglumine-enhanced MR imaging: prospective study. Radiology. 2005 Jul;236(1):166-77. Epub 2005 Jun 13.
6. Koh DM, Brown G, Riddell AM, Scurr E, Collins DJ, Allen SD, Chau I, Cunningham D, deSouza NM, Leach MO, Husband JE. Detection of colorectal hepatic metastases using MnDPDP MR imaging and diffusion-weighted imaging (DWI) alone and in combination. Eur Radiol 2008; 18: 903-910.
7. Marin, Daniele et al. Imaging Approach for Evaluation of Focal Liver Lesions Clinical Gastroenterology and Hepatology , Volume 7 , Issue 6 , 624 – 634.
8. Hamm B, Thoeni RF, Gould RG, Bernardino ME, Lüning M, Saini S, Mahfouz AE, Taupitz M, Wolf KJ. Focal liver lesions: characterization with nonenhanced and dynamic contrast material-enhanced MR imaging. Radiology. 1994 Feb;190(2):417-23.