ORIGINAL RESEARCH PAPER

Radio-Diagnosis

MAGNETIC RESONANCE IMAGING EVALUATION OF FOCAL LIVER LESIONS WITH HISTOPATHOLOGICAL CORRELATION

KEY WORDS: Focal liver lesions, MRI.

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ABSTRACT

Focal masses are diagnosis using ultrasonography (USG) and/or computed tomography(CT). Additionally, magnetic resonance imaging (MRI) is preferred when further characterization of these masses in needed. MRI has many advantages(e.g., high contrast resolution, the ability to obtain images in any plane, lack of ionizing radiation, and the safety of using particulate contrast media rather than those containing iodine) that make it a favored modality. Lesion morphology, signal intensity, and contrast enhancement pattern are taken into consideration when characterizing masses with MRI. A comprehensive MR imaging examination in this setting includes T2 – weighted and chemical shift T1 – weighted imaging, diffusion weighted imaging and gadolinium – enhancement – pattern assessment, characteristic enhancement patterns that can be helpful in the diagnosis of most of these lesions. These patterns can be seen during particular phases of contrast – enhanced imaging and include arterial- phase or delayed – phase enhancement, peripheral washout, ring enhancement, nodule – within – a – nodules enhancement, true central scar, pseudo central scar and pseudo capsule. The combination of findings form different sequences often helps pinpoint the etiology of a liver mass. Familiarity with- these enhancement patterns and mass characteristics in various sequences can help in the identification of specific focal lesions of the liver.

INTRODUCTION

The liver has a number of complex but essential role within the metabolism of amino acids, carbohydrates and lipids as well as synthesis of proteins. The basic pathophysiology of parenchymal disease usually represents a failure in one of these metabolic pathways. Parenchymal lesions may be focal or diffuse, focal lesion may be native or metastasis from other part of the body1 . Liver lesions or hepatic lesions are the lesions or growths on or in the liver. These lesions can be benign or malignant. Benign liver lesions are more common than malignant lesions. Benign lesions include haemangioma, the most common benign tumour of liver. Focal nodular hyperplasia,second most prevalent benign tumour and others includes hepatic adenomas, angiomyolipoma and bile duct cyst adenoma. In malignant liver lesions, most cases are metastases from other tumours, frequently of the gastrointestinal tract (like colon cancer, carcinoid tumoursmainly of the appendix, etc.), breast cancer,ovarian cancer, lung cancer, renal cancer, prostate cancer, etc. The most frequent, malignant primary liver cancer is hepato-cellular carcinoma followed by cholangiocarcinoma, combined hepato-cellular and cholangiocarcinoma, hepatoblastoma, bile duct cystadenocarcinoma, fibrolamellar carcinoma, tumors of mesenchymal tissue. Hepatoblastoma, the most prevalent malignant tumor in children2. The noninvasive diagnosis of liver lesions is usually achieved by transabdominal sonography, CECT and MRI. Dynamic three-dimensional gradient-recalled-echo MR imaging provides dynamic contrastenhanced thin-section images with fat saturation and a high signal-to-noise ratio and is excellent for the evaluation of various focal hepatic lesions. A comprehensive MR imaging examination in this setting includes T2-weighted and chemical shift T1-weighted imaging and demonstrates characteristic enhancement patterns that can be helpful in the diagnosis of most of these lesions. These enhancement patterns are seen during particular phases of contrastenhanced imaging and include arterial phase enhancement, delayed phase enhancement, peripheral washout, ring enhancement, nodule-within-a-nodule enhancement, true central scar, pseudo central scar, and pseudo capsule. Hence familiarity with these enhancement patterns can assist in the identification of specific focal lesions of the liver4 . Magnetic resonance angiography (MRA), magnetic resonance venography (MRV), and magnetic resonance cholangiopancreatography (MRCP). Biochemical imaging with MR spectroscopy is also available. The goal of a complete, non-invasive evaluation of the liver has been realized and is widely available with modern scanners and techniques. The optimal imaging modality for the detection of liver lesions has been robustly debated over the past two decades. Improved hardware, MR technique, and contrast agents allow MRI to evaluate the liver completely and noninvasively. The radiologist must have a solid understanding of current MRI techniques for appropriate management of liver lesions

Aims & Objectives of the Study

To study various MRI patterns of focal hepatic lesions to

- Detection and characterization of focal hepatic lesions with histopathological correlation.
- Differentiation of benign from malignant liver lesions.
- Differentiation of liver metastasis from primary liver lesion

METHODOLOGY

SOURCE OF DATA:

Patients with clinical, biochemical, ultrasound and CT evidence of liver pathology who were referred to the department of Radio diagnosis , GGH Kurnool for diagnosis.

METHOD OF COLLECTION OF DATA:

a) Study design: Prospective study.

b) Study Place: Department of Radio- diagnosis and imaging, KMC

c) Study duration : Nov 2019 to Nov 2021

d) Sample size : Initially a minimum of 50 cases are taken up, however the scope of increasing the number of cases exists depending upon the availability within the study period.

e) Inclusion criteria :

a. Patients presenting with focal hepatic lesions was suspected clinically(positive symptoms/ deranged LFT).

b. Patients who had hepatic abnormalities on earlier imaging studies

c. Patients who are otherwise healthy yet have abnormal hepatic imagingetc:
d. Patients with indeterminate liver lesions detected on USG or CT.

f) Exclusion criteria :

- All patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic implants.
- Patient having history of claustrophobia.
- All patients who do not consent to be a part of the study. Renal dysfunction (eGFR < 40ml/ min/1.732) stage 4 & 5 CKD

IMAGING TECHNIQUES

1. Axial T2-weighted FSE with TR/TE 1826/180, Field of view 40x40cm, Matrix 256 x 256, Slice thickness 5mm with inter slice gap of 2.5mm, number of excitations (NEX) = 0.5

2. Axial pre contrast DIXON with TR = 4.4, TE = 2, slice = 5 mm with interslice gap of 2.5mm, average MA = 320 x 160, NEX = 0.7Axial in phase and opposed phase 2D SPGR sequences were acquired.

3. Diffusion-weighted respiratory-triggered single-shot spin echo echoplanar imaging (SS SEEPI) sequence using b-values 800 s mm–2 . The quantitative analysis of the diffusion (ADC) was calculated on a workstation by applying a ROI on the image.

4. Dynamic Gd-enhanced MR imaging using the fatsuppressed Multiphase DIXON was subsequently performed in the arterial, portal venous phases and equilibrium phases. The imaging parameters were kept identical. A power-injector was used for the gadolinium injections (Omniscan,Philips health care, 0.1 m mol/kg body weight; injection rate 2 ml/s). Liver-specific contrast agent gadobenate dimeglumine (Gd-BOPTA), and gadoxetic acid (Gd-EOB-DTPA) were used whenever necessary

RESULTS

The present study was conducted in the Department of Radiodiagnosis GGH ,Kurnool Medical College ,Kurnool .The study population comprised of all the patients with suspicion of hepatic masses on clinical and/or Ultrasonography findings. A total of 50 cases with hepatic lesions were evaluated using MRI.

Out of 50 cases, There were a total of 29 benign and 21 malignant masses. Most common benign hepatic tumour was hemangiomas while Metastases was most common malignant hepatic tumour. 66% of the cases included in the study were males and 17% were females.

TABLE 1: DISTRIBUTION OF CASES

Gender	No of patients	%
MALE	33	66
FEMALE	17	17

Table 2. SEX DISTRIBUTION IN PATIENTS WITH FOCAL LIVER LESIONS

RADIOLOGICAL DIAGNOSIS	No of Cases	FINAL DIAGNOSIS (PATHOLOGICAL CONFIRMATION)	
		Same	Different
Focal Fatty infiltration	2	2	_
Simple Cyst	3	3	_
Liver abscess	6	6	-
Kochs granuloma	1	1	-
Haemangioma	7	7	-
Regenerative nodule	1	1	-
Cholangiocarcinoma	3	3	-
Hydatid cyst	6	6	
Poly cystic liver disese	1	1	
Bilary hamartoma	1	1	
Hepatocellular carcinoma	7	5	1(Metastases) 1(cholangio carcinoma)
Hepatic adenoma	1	1	_
Lymphoma	1	-	Kochs granuloma
Metastases	10	9	1(Regenerative nodule)
Total	50	46(92%)	4(8%)

Table 3 FINAL DIAGNOSIS(PATHOLOGICAL CONFIRMATION) Vs RADIOLOGICAL DIAGNOSIS

LESION	No.of patients	%
BENIGN LESIONS		
Haemangioma	7	14
Hydatid cyst	6	12
Abscess	6	12
Simple hepatic cyst	3	6
Focal fatty infiltration	2	4
Hepatic adenoma	1	2
Poly cystic liver disease	1	2
Kochs granuloma	1	2
Biliary hamartoma	1	2
Regenerative nodule	1	2
MALIGNANT LESIONS		
Metastases	10	20
Hepatocellular carcinoma	7	14
Cholangio carcinoma	3	6
Lymohoma	1	2
Total	50	100

SUMMARY AND CONCLUSIONS

- A total of 50 patients varied from 2 years to 70 years of age with hepatic lesions were studied with maximum, 36% in the 51-60 years age group.
- 66% of the patients were males with male to female ratio, 2:1
- Nontumorous hepatic mass lesions constituted 40% and Benign hepatic tumours were 18% while Malignant lesions were 42%.
- Metastases was the most common lesion in our series 20% of all cases. It was also the most prevalent malignant lesion constituting 47.61% of all malignant cases.
- MRI has 100% sensitivity and 93.55% specificity for malignant mass lesions and 93.55% sensitivity and 100% specificity for non malignant conditions.
- Simple cyst appear as well defined anechoic Lesion with posterior enhancement without any vascularity on Doppler. Diagnosis can be confirmed based on USG and CT findings However MRI revealed further information of internal contents of cyst with the help of different sequences.
- Diagnosis of hydatid cyst can be confirmed on USG itself with the following pathognomic features: hydatid sand and floating membrane. A specific finding was noted on MRI in the form of a low intensity rim surrounding the lesion on T1W and T2W images.

- Sonographic distinction between amoebic and pyogenic abscess is possible in many cases. Amoebic abscesses are predominantly solitary, well defined and hypoechoic with posterior enhancement. On MRI, perilesional edema was found to be specific for amoebic liver abscess. Hemangiomas have a well defined hyperechoic appearance on USG small lesions were well defined and homogeneous while lesions greater than 6cm in size may show heterogeneous pattern. MR reveals low intensity signal on T1w images while very high signal intensity on T2w images with characteristic finding of peripheral nodular enhancement with delayed centripetal filling. MRI was specially helpful in small

- lesion to differentiate from small HCC as 72 haemangioma are bright on T2WI Hence MR findings are found to be diagnostic.

- HCC is presents as a solid heteroechoic lesion with ill defined margins with diffuse vascularity.MRI is helpful in differentiating benign nodules from dysplastic nodules which may show malignant HCC focus.

- Metastases showed a varied appearance on USG. The most common sonographic pattern was that of a multiple, well defined, solid hypoechoic lesion involving the liver. The vascularity of the metastatic lesions is reflective of the vascularity of the primary tumour. Hypervascular metastasis shows a peripheral pattern of vascularity in contrast to the diffuse pattern seen in HCCs. MR reveals non specific findings.

- Focal fatty infiltration can not be differentiated from hepatic lesion on USG ,MRI can differentiate it from hepatic lesions. Ultrasonography is a useful screening modality for hepatic lesions. All patients suspected of hepatic lesions should be subjected to ultrasonography for initial detection and localisation of lesion.

- With a sensitivity of 92 percent, MRI is a good diagnostic technique for characterising hepatic masses. The findings of this study show that MRI with strong soft tissue contrast and multiplanar imaging has advantages.good sensitivity and specificity in the detection and characterisation of a variety of hepatic lesions. It is recommended that US should be the initial screening modality in a patient suspected of having a hepatic lesion and CT and MRI should be used for further characterisation of the lesion as well as the staging of the malignant lesion

CASE OF MATASTASES

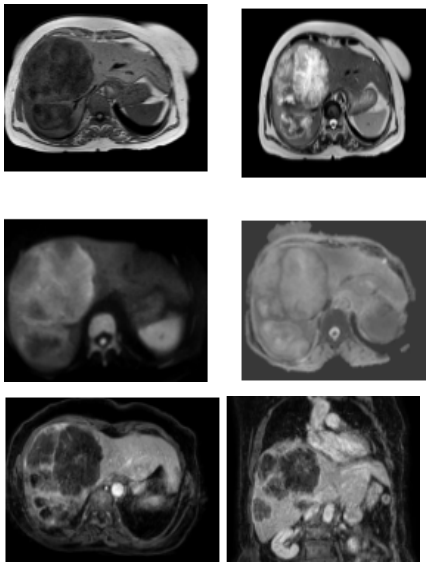
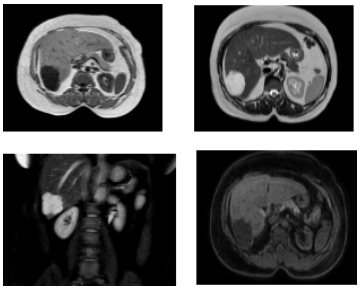


Fig. 01 Multiple well defined lesions noted in the both liver lobes, hypointense on axial T1-weighted (A) and hyperintense on axial T2- weighted images (B) with peripheral diffusion restriction on DWI and ADC (C) and (D).Postcontrast axial images demonstrate periphera rim enhancement in the arterial phase (E) and venous (F).Biopsy proven case of hepatic metastases of colon malignancy

CASE OF HEPATIC HAEMANGIOMA



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