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EFFICACY COMPARISON OF MULTI-PHASE CT AND HEPATOTROPIC CONTRAST-ENHANCED MRI IN THE DIFFERENTIAL DIAGNOSIS OF FOCAL NODULAR HYPERPLASIA: A PROSPECTIVE COHORT STUDY

Dr.Sachin Shetty Karunakar*

Associate Professor, Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Kanchipuram, Tamilnadu, India

ABSTRACT

FNH (focal nodular hyperplasia) is a benign lesion that is made up of hyperplastic hepatocytes isolated by fibrous septa and a central scar. FNH is most likely a product of a reaction. Following hemangioma, it is the most common benign liver lesion, and it normally occurs in normal liver parenchyma. It affects 0.3 percent to 6% of the general population , but the rate is rising, thanks in part to advances in radiological imaging. Different clinical and pathological characteristics affect the importance of distinguishing FNH from other hypervascular liver lesions such as hepatocellular adenoma (HCA), hepatocellular carcinoma (HCC), and hypervascular metastases, as appropriate care is crucial. FNH has a wide range of clinical signs and biochemical parameters.The aim of this study is to compare the efficacy of multi-phase multi-detector CT and MRI with the use of the hepatotropic contrast agent Gd-BOPTA in distinguishing FNH from other focal liver lesions (FLLs) in patients with equivocal foci on ultrasonography. The number of patients in final diagnosis in the non FNH group include 64 patients with HCC, HH with 105, Metastases in 7, HCA in 12 patients. Patients' age and lesion diameter were also statistically important differences: the mean age in the FNH group was 36 years (1856) vs 56 years (2179) in the non-FNH group (Z = 6.97, p 0.0001), and the mean diameter of a target in the FNH group was 37 mm (1085 mm) vs 29 mm (580 mm) in the non-FNH group (Z = 4.03, p 0.0001).All parameters had high interobserver reproducibility and consensus, with Kappa values of 0.851.0.In the differential diagnosis of FNH, MRI analysis with the administration of hepatotropic contrast agent is more successful than multi-phase multi-detector CT. Hepatotropic compounds allow for simultaneous evaluation of vascularization of focal changes and hepatocyte function (extracellular step and liver-specific analysis in the one-stop-shop examination).

Key words: Focal Nodular Hyperplasia, Multi-Phase Ct And Hepatotropic Contrast-Enhanced Mri.

INTRODUCTION

FNH (focal nodular hyperplasia) is a benign lesion that is made up of hyperplastic hepatocytes isolated by fibrous septa and a central scar (see Additional file 1) [1]. FNH is most likely a product of a reaction.Following hemangioma, it is the most common benign liver lesion, and it normally occurs in normal liver parenchyma [2]. It affects 0.3 percent to 6% of the general population , but the rate is rising, thanks in part to advances in radiological imaging.Different clinical and pathological characteristics affect the importance of distinguishing FNH from other hypervascular liver lesions such as hepatocellular adenoma (HCA), hepatocellular carcinoma (HCC), and hypervascular metastases, as appropriate care is crucial [3]. FNH has a wide range of clinical signs and biochemical parameters [4]. Ultrasonography and core needle biopsy do not have a definitive diagnosis. Furthermore, due to atypical radiological characteristics, proper diagnosis of

Corresponding Author :- **Dr.Sachin Shetty Karunakar**

FNH in computed tomography (CT) and magnetic resonance imaging (MRI) may be impossible in around 30% and 20% of cases, respectively. MRI with organ-specific contrast agents, on the other hand, improves diagnosis [5].

Gadoxetic acid and gadobenate dimeglumine are two hepatotropic contrast agents available (Gd-BOPTA). During the first few minutes, hepatotropic contrast agents used in MRI have a vascular-interstitial distribution and are partly excreted by the kidneys into urine [6]. Hepatocytes with normal metabolism take up 3–5% of Gd-BOPTA and 50% of gadoxetic acid, which is secreted into the bile . The enhancement of the liver parenchyma can be seen in the so-called hepatobiliary process due to contrast agent absorption by hepatic cells (HBP). Gd-BOPTA enhances memory for 1–4 hours and gadoxetic acid enhances memory for 20–40 minutes[7]. Lesions lacking active hepatocytes enhance less or do not enhance at all compared to surrounding parenchyma.In comparison to hepatic hemangiomas (HH), the majority of metastases, and hepatocellular carcinomas, parenchymal cells that make up FNH accumulate hepatotropic contrast agents (HCC) [8, 9, 10].

A traditional receiver operating characteristic (ROC) is insufficient to compare the effectiveness of two imaging modalities (CT vs. MRI) in the evaluation of multiple liver lesions in different locations [11, 12]. The alternative free-response receiver operating characteristic (AFROC) approach, on the other hand, takes into account the position of lesions as well as the reader's trust level . The AFROC curve is a graph of the fraction of correctly diagnosed lesions in their true position (lesion location fraction, LLF) versus the false positive fraction [13].

Aim and objective:

The aim of this study is to compare the efficacy of multi-phase multi-detector CT and MRI with the use of the hepatotropic contrast agent Gd-BOPTA in distinguishing FNH from other focal liver lesions (FLLs) in patients with equivocal foci on ultrasonography.

Material and methods :

We included 200 patients in this prospective study who had equivocal FLLs found on ultrasonography but no contraindications to CT or MRI, which included the administration of iodine contrast agent and Gd-BOPTA, respectively.Within four weeks, multi-phase multi-detector CT and dynamic contrast enhanced liver MRI were performed using the hepatotropic contrast agent Gd-BOPTA.40 patients failed to turn up for their initial MRI or follow-up appointment. Seven patients were ruled out due to MRI artefacts that prevented further examination of their lesions. Protocol for CT and MRI scans.

Results and discussion :

The study included 159 patients who underwent both CT and MRI scans.The final diagnosis in 90 patients was based on histopathological examination: 21 patients had FNH, 64 had HCC, 12 had HCA, and 7 had metastases.The final diagnosis was based on clinical and imaging follow-up in the remaining 69 patients, which revealed HH in 108 patients, FNH in 18 patients, and liver metastases in 21 patients. Histopathological review revealed the central scar in 15 patients with FNH.Congestion was found in the majority of the FNH specimens.

Table 1 lists both non-FNH and FNH clinical symptoms that led to an initial ultrasound examination and subsequent CT and MRI examinations.On the basis of core needle biopsy, liver cirrhosis was identified in 28 patients, 35 of whom were diagnosed with HCC, 8 with renal cancer metastasis, and 8 with colorectal cancer metastases.In the FNH sample, 10 patients had a small increase in serum GGTP levels; in the remaining cases, biochemical examinations revealed no major improvements, and none of the patients were diagnosed with cirrhosis. FLLs were discovered during a follow-up abdominal ultrasonography in six patients with a history of cancer. FNHs is discovered by chance in 21 cases (Table 1).

Table 2 compares the characteristics of patients in the FNH and non-FNH classes. There were total of 159 patients (Table 3).

HCA Hepatocellular adenoma, HCC Hepatocellular carcinoma, HH Hepatic hemangioma

The number of patients in final diagnosis in the non FNH group include 64 patients with HCC, HH with 105 , Metastases in 7, HCA in 12 patients. Patients' age and lesion diameter were also statistically important differences: the mean age in the FNH group was 36 years (1856) vs 56 years (2179) in the non-FNH group ($Z = 6.97$, p 0.0001), and the mean diameter of a target in the FNH group was 37 mm (1085 mm) vs 29 mm (580 mm) in the non-FNH group ($Z = 4.03$, p 0.0001).All parameters had high interobserver reproducibility and consensus, with Kappa values of 0.851.0.

There are a few drawbacks to this report. To begin with, diffusion-weighted imaging in MRI was not considered in the study. The research, however, was only intended to evaluate the effectiveness of morphological and contrast-enhanced examinations. Second, not all lesions were confirmed histologically. Clinical and radiological follow-up were used to make the final diagnosis in 43% of patients. This category included all HH cases and nearly half of FNH cases in which a biopsy was either impossible or unnecessary. Finally, rare entities such as fibrolamellar carcinoma, nodular regenerative hyperplasia, and cholangiocarcinoma are not included in the study community. We did not come across some unusual neoplasms, despite the fact that we included

incidental findings and the examined population was reasonably large. Finally, though we have shown that MRI is more effective than CT in diagnosing FNH, the cost effectiveness of both examinations must be considered. This is a subject that is beyond the reach of this article.Finally, it should be noted that if a new FLL is discovered during the course of cirrhosis, it is unlikely to be FNH.Even if the lesion has radiological features of FNH, a liver biopsy should be performed in this case.

Table 1:The indication for performing ultrasonography in patients examined by CT and MRI (n=159)		
	Non+ FNH	**FNH**
Digestive tract carcinoma (colorectal/pancreatic / gastric carcinoma)	20/8/1	2/1/1
Renal carcinoma	8	4
Melanoma Malignum	1	3
Other Neoplasm	3	1
Hepatic cirrhosis a	28	5
Abdominal Pain	35	2
No symptoms	23	3

Table 2 : Characteristics of the non- FNH and FNH group		
	Non FNH	**FNH**
Number of patients	116	43
Number of foci	65	94
Average age	85	74
Male/ female ratio	85/74	67/92

Table 3: Final diagnosis in the non FNH group		
Histopathological diagnosis	**Number of patients**	**Number of foci**
HCC	64	95
HH	105	54
Metastases	7	152
HCA	12	147

CONCLUSION

A valuable diagnostic tool is dynamic contrast-enhanced MRI with hepatobiliary process after Gd-BOPTA administration. Tiny and/or highly differentiated foci of HCC, strongly enhancing after contrast agent administration in HAP and isointense in HBP, are the method's only drawback. It can be prevented with the help of the referring physician and the radiologist, as well as the exclusion of patients with suspected liver cirrhosis. In the differential diagnosis of FNH, MRI analysis with the administration of hepatotropic contrast agent is more successful than multi-phase multi-detector CT. Hepatotropic compounds allow for simultaneous evaluation of vascularization of focal changes and hepatocyte function (extracellular step and liver-specific analysis in the one-stop-shop examination).

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