



ORIGINAL REPORT

## Variations in the size of focal nodular hyperplasia on magnetic resonance imaging<sup>☆</sup>

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### KEYWORDS

Focal nodular hyperplasia;  
Liver magnetic resonance imaging;  
Natural history;  
Follow-up;  
Birth control pills

### Abstract

**Objective:** To evaluate the changes in the size of focal nodular hyperplasia (FNH) during long-term magnetic resonance imaging (MRI) follow-up.

**Material and methods:** We reviewed 44 FNHs in 30 patients studied with MRI with at least two MRI studies at least 12 months apart. We measured the largest diameter of the lesion (in mm) in contrast-enhanced axial images and calculated the percentage of variation as the difference between the maximum diameter in the follow-up and the maximum diameter in the initial study. We defined significant variation in size as variation greater than 20%. We also analyzed predisposing hormonal factors.

**Results:** The mean interval between the two imaging studies was  $35 \pm 2$  months (range: 12–94). Most lesions (80%) remained stable during follow-up. Only 9 of the 44 lesions (20%) showed a significant variation in diameter: 7 (16%) decreased in size and 2 (4%) increased, with variations that reached the double of the initial size. The change in size was not related to pregnancy, menopause, or the use of birth control pills or corticoids.

**Conclusion:** Changes in the size of FNHs during follow-up are relatively common and should not lead to a change in the diagnosis. These variations in size seem to be independent of hormonal factors that are considered to predispose.

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### PALABRAS CLAVE

Hiperplasia nodular focal;

### Variación de tamaño de la hiperplasia nodular focal mediante resonancia magnética

#### Resumen

**Objetivo:** Evaluar los cambios en el tamaño de la hiperplasia nodular focal (HNF) mediante seguimiento a largo plazo con resonancia magnética (RM).

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**Material y métodos:** Se revisaron 44 HNF de 30 pacientes, estudiadas mediante RM con al menos 2 estudios separados como mínimo 12 meses. Se midió (en mm) el diámetro mayor de la lesión en las imágenes transversales de RM con contraste, calculándose el porcentaje de variación como la diferencia entre el diámetro máximo en el seguimiento respecto al diámetro máximo inicial. Se definió como variación significativa de tamaño un porcentaje de variación superior al 20%. Se analizaron los factores hormonales predisponentes.

**Resultados:** La media del intervalo de tiempo entre las 2 pruebas de imagen fue de  $35 \pm 2$  meses (rango: 12–94). La mayoría de las lesiones (80%) permanecieron estables durante el seguimiento, y solo 9 de las 44 lesiones (20%) mostraron una variación significativa de su diámetro. Siete de ellas (16%) disminuyeron de tamaño y 2 (4%) aumentaron, con variaciones que alcanzaron hasta el doble del tamaño inicial. El cambio de tamaño no se pudo relacionar con el embarazo, la menopausia ni el uso de anticonceptivos orales o corticoides.

**Conclusión:** Los cambios de tamaño de la HNF durante el seguimiento son relativamente frecuentes y no deben disuadir de este diagnóstico. Estas variaciones parecen independientes de los factores hormonales considerados como predisponentes.

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## Introduction

Focal nodular hyperplasia (FNH) is the second most frequent benign liver lesion after hemangioma. It is present in more than 3% of the population, prevailing among young women, although it may occur in both sexes and in all age groups.<sup>1</sup> Microscopically, FNH is made up of normal hepatocytes, Kupffer's cells and blood vessels, surrounded by fibrous septa containing a variable number of primitive biliary conduits.<sup>2</sup> Although its etiology is not proved, it seems that a preexisting congenital vascular anomaly or a vascular malformation trigger the hyperplastic stimulus.<sup>3</sup>

FNH is usually asymptomatic and it is frequently detected incidentally in liver radiologic studies performed for other causes. In this lesion, spontaneous rupture is very rare and malignant transformation is even more so. Therefore, after accurate diagnosis with the current image methods, treatment is conservative and only clinical follow-up must be established and then by means of medium- and long-term image tests.<sup>4</sup>

Conventional MR and dynamic studies after administration of contrast offer, using strict image criteria, a greater sensitivity and specificity in the diagnosis of FNH as compared to echography or TC.<sup>5–7</sup> In the last few years, MR specificity to characterize FNH has increased with the introduction of hepatobiliary contrasts, which have caused specificity to come close to 100%, which avoids the need to perform other invasive diagnostic techniques and procedures.<sup>8,9</sup> Histological study of the samples obtained by means of percutaneous biopsy has, in addition, certain limitations especially at the hands of pathologists with limited experience in these lesions.<sup>10</sup> MR has greater sensitivity (74–78%) than either echography (20%) or CT (60%)<sup>5,6</sup> to detect the central FNH scar. Moreover, it is more sensitive than echography to detect FNH lesions, due to the fact that the lesion's echogenicity is similar to that of the adjacent parenchyma, and it has the advantage of not using ionizing radiations such as CT. That is why MR is considered the image test of choice for characterizing and following up these benign focal hepatic lesions.

Medium-long term FNH follow-up by means of image tests do not generally show changes in the size of the nodules,<sup>11,12</sup> although on occasion both lesion regression and progression

have been documented.<sup>13–15</sup> However, serial MR studies comparing the size of lesions are few.<sup>11–13</sup>

The objective of this study is to evaluate the degree of variation of FNH size by means of contrasted MR dynamic images given this test's maximum sensitivity to delimit lesions, so as to know FNH natural history.

## Material and methods

MR images of 30 patients presenting a definite FNH diagnosis were reviewed as well as at least 2 MR examinations. The definite diagnosis was by histology or by typical criteria in MR. All the subjects belonged to 2 hospitals and the sample was obtained from a 10-year retrospective search (2000–2010). None of the patients had a history of chronic hepatopathies or primary neoplasia.

The patients signed an informed consent in writing to use a contrast medium in MR and the use of their data in scientific evaluations. Since the study was retrospective and the patients authorized the use of the data for scientific purposes, it was deemed unnecessary to request approval from the ethics committee.

The series was made up of 23 women and 7 men, with ages ranging from 18 to 83 years (median:  $39 \pm 9$  years). Before the diagnosis, 7 women (23%) were taking oral contraceptives and one man (3%) steroids. Two women (6%) became pregnant during follow-up after diagnosis. Six patients (20%) had been postmenopausal for over a year before diagnosis, but none of them was taking substitutive hormonal therapy.

FNH lesions were single in 21 patients (70%) and multiple in 9 (30%). In order to avoid measurement errors with digital calibrators and partial volume biases, only the FNH lesions presenting a diameter greater than 10 mm upon diagnosis were included. Finally, 4 patients with 2 lesions and 5 patients with 3 lesions were counted; therefore the total number of FNH lesions studied was 44. The images were acquired with an MR machine of 1.5 T (Philips Medical Systems, Best, the Netherlands) with body coils. The study protocol differed minimally between the two hospitals, but it remained stable during all the 10-year follow-up period. In all the examinations gradient echo (GE) sequences were performed adjusted on T1

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