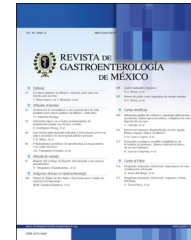




# REVISTA DE GASTROENTEROLOGÍA DE MÉXICO

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## REVIEW ARTICLE

# Diagnosis and quantification of fibrosis, steatosis, and hepatic siderosis through multiparametric magnetic resonance imaging<sup>☆</sup>

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### KEYWORDS

Fibrosis;  
Magnetic resonance  
elastography;  
Viral hepatitis;  
Steatosis;  
Hepatic steatosis;  
Hepatic siderosis

### Abstract

**Background:** The presence of liver fibrosis is the common denominator in numerous chronic liver diseases that can progress to fibrosis and hepatocellular carcinoma. Most important, with respect to frequency, are viral hepatitis and non-alcoholic fatty liver disease, the prevalence of which is increasing in epidemic proportions. Liver biopsy, albeit imperfect, continues to be the criterion standard, but in many clinical situations tends to be replaced with noninvasive imaging methods.

**Objectives:** The aim of the present article was to describe our imaging department experience with magnetic resonance elastography and to analyze and discuss recently published results in gastroenterology, hepatology, and radiology from other authors in the literature, complemented with a PubMed search covering the last 10 years.

**Results and conclusions:** Magnetic resonance elastography is an efficacious, noninvasive method with results that are concordant with liver biopsy. It is superior to ultrasound

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**PALABRAS CLAVE**

Fibrosis;  
Elastografía por  
resonancia-  
magnética;  
Hepatitis virales;  
Esteatosis;  
Esteatohepatitis;  
Hepatosiderosis

elastography because it evaluates a much greater volume of hepatic tissue and shows the often heterogeneous lesion distribution. The greatest advantage of the magnetic resonance protocol described is the fact that it quantifies fibrosis, fat content, and iron content in the same 25 min examination specifically directed for that purpose, resulting in a favorable cost-benefit ratio for the patient and/or institution.

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### Diagnóstico y cuantificación de fibrosis, esteatosis y hepatosiderosis por medio de resonancia magnética multiparamétrica

**Resumen**

*Antecedentes:* La presencia de fibrosis hepática es el denominador común de numerosas enfermedades crónicas del hígado que pueden evolucionar a fibrosis y a hepatocarcinoma. Las más importantes por su frecuencia son las hepatitis virales y el hígado graso no alcohólico, cuya prevalencia aumenta en proporciones epidémicas. La biopsia hepática, aun cuando imperfecta, continúa siendo el estándar de oro que tiende a ser reemplazado en muchas situaciones clínicas por métodos de imagen no invasivos.

*Objetivos:* Describir la experiencia obtenida en nuestro departamento de imagen con la técnica de elastografía por resonancia magnética, analizar y comentar los resultados publicados por otros autores en la literatura reciente en gastroenterología, hepatología y radiología, complementada con una búsqueda en PubMed de los últimos 10 años.

*Resultados y conclusiones:* La elastografía por resonancia magnética es un método no invasivo y eficaz, cuyos resultados tienen concordancia con la biopsia hepática, presenta superioridad sobre los métodos de elastografía por ultrasonido debido a que evalúa un volumen mucho mayor de tejido hepático y muestra la distribución de las lesiones que, a menudo, es heterogénea. La mayor ventaja del protocolo de resonancia magnética descrito estriba en cuantificar en la misma sesión, además de la fibrosis, el contenido de grasa y de hierro, lo cual se realiza en una exploración dirigida específicamente a este fin, en un tiempo de 25 min y a un costo-beneficio favorable para el paciente y la institución.

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**Introduction**

Liver fibrosis is the cicatrization response that is a consequence of acute or chronic liver damage due to a variety of causes. It is a dynamic and potentially reversible repair process that is associated with hepatocellular regeneration. The activation of stellar cells causes fibroblast proliferation and excessive extracellular matrix deposit. Fibrous bands are produced, distorting the structure of the liver, forming scars and regeneration nodules. Consequently, liver function is altered and there is increased hepatic resistance to the blood flow, causing chronic liver disease (CLD), manifested by cirrhosis and complications such as: liver failure, portal hypertension, and hepatocellular carcinoma (HCC).<sup>1,2</sup>

The main causes of cirrhosis in the industrialized countries include chronic hepatitis C and B virus infections, immoderate alcohol ingestion, and nonalcoholic fatty liver (NAFL) that can progress to nonalcoholic steatohepatitis (NASH) and cirrhosis.

The prevalence of viral infections and alcoholism as causes of CLD remained stable between 1998 and 2008. In contrast, the prevalence of NAFL as a cause of CLD has increased from 46.8 to 75.1% within the same time frame.<sup>3</sup> NAFL has become the most frequent cause of CLD in the United States and Europe, associated with the prevalence of obesity and metabolic syndrome. The continuing increase in NAFL prevalence is estimated to substantially contribute to the increase in CLD and will represent an epidemiologic burden in numerous countries, including Mexico.<sup>4-6</sup>

The diagnosis of fibrosis has recently gained importance due to the fact that its various causes can be prevented or treated, making it potentially reversible if the causal factor is eliminated.<sup>2,5</sup> Clinical management of these patients requires knowing the stage of fibrosis and the frequently coexisting fat and iron contents, and their increase or reduction during the course of treatment.

Liver biopsy, traditionally considered the "criterion standard" for diagnosis has several limitations: it is invasive, costly, subject to complications, and allows only a very

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