The role of MRI using liver-specific contrast agent in the assessment of focal liver lesion

O papel da ressonância magnética com o uso do meio de contraste hepatoespecífico na avaliação da lesão hepática focal

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In the last decade, magnetic resonance imaging (MRI) with the use of intravenous extracellular contrast agents (for example, Gd-DTPA and Gd-DOTA) has been recognized as the noninvasive diagnostic tool of choice in the evaluation of focal liver lesions[1–5] thanks to the fact that it does not require ionizing radiation in association with its high spatial resolution and excellent tissue contrast; its capability to study the vascular behavior of the lesion and to detect the presence of fat component in the lesion, besides allowing the differentiation of intrinsic tissue characteristics such as relaxation time and distribution of water in the liver lesion as well as in the surrounding parenchyma. Such aspects, among others, have led MRI to be rated as a molecular imaging method[3].

However, despite those unquestionable advantages, MRI presents some limitations related to the differentiation of certain focal liver lesions in cirrhotic patients, such as focal nodular hyperplasia (FNH) versus adenoma and dysplastic nodule versus hepatocellular carcinoma (HCC) whose imaging findings are similar to each other but require distinctive approaches[6,7]. Liver-specific contrast agents have been introduced to overcome such limitations and, among others, gadoxetic acid (Gd-EOB-DTPA)[8,9] that was recently made commercially available in Brazil, can be mentioned.

Gadoxetic acid (or gadoxetate disodium) is a paramagnetic contrast agent whose enhancement effect is mediated by a linear ion complex formed by gadolinium and ethoxy benzyl-diethylenetriaminepentaacetatic acid (EOB-DTPA). Because of the lipophilic property of the EOB component (ethoxy benzyl) combined with the DTPA hydrophilic property, the gadoxetic acid shows a two-phase or two-compartmental distribution pattern, i.e., after injection, the agent distributes into the vessels and extracellular spaces during the dynamic phases of hepatic enhancement (arterial, portal and equilibrium phases) and later on shows progressive hepatocytes uptake and subsequent complete renal and hepatobiliary excretion in equivalent amount in cases where the liver and kidneys function is preserved[8–10]. Because of such a characteristic, gadoxetic acid is considered to be a "mixed action" (extracellular and hepatobiliary) contrast agent[9].

Thus, it provides not only information related to the extracellular enhancement during the dynamic phases of hepatic perfusion, but also data related to the enhancement resulting from its liver-specific properties during the hepatobiliary phase, which occurs between ten and twenty minutes after intravenous contrast injection[11]. Therefore, the typical focal liver lesions enhancement pattern observed during the dynamic perfusion phase is reproduced with the utilization of gadoxetic acid[11]. Additionally, as a function of the presence of its lipophilic component, there is a progressive contrast medium uptake by hepatocytes, and increase in the signal intensity of the parenchyma on T1-weighted images because of the shortening of T1 relaxation time, differently from the behavior in the cells of most liver nodules where hepatocytes are absent (for example, metastases and poorly differentiated HCCs), allowing their differentiation from hepatocytic nodules (for example, FNH, regenerative and dysplastic nodules)[11,12].

In the last years, several studies have demonstrated that the use of gadoxetic acid is safe[13–15] and increases the MRI effectiveness in the detection or diagnostic differentiation of several liver nodules such as metastasis, HCC, adenomas and FNH[16–19], with a performance superior or even complementary to extracellular contrast-enhanced computed tomography and MRI[20–22].

In this sense, the study developed by Francisco et al.[23] and published in the present issue of **Radiologia Brasileira,** comprehensively approaching the role played by gadoxetic acid in the evaluation of focal liver lesions, is welcome. In such study, the authors clearly present the subject matter, describing the main features, indications, ways of administration and an optimized protocol for cases where the liver-specific (or hepatobiliary) contrast agent is adopted, besides describing its influence on the diagnosis of the different types of focal liver lesions.

Despite the higher cost as compared with other widely available extracellular contrast agents, besides the necessity of a more elaborate injection technique to get satisfactory results, and based on the findings of many published studies, it is our opinion that the use of gadoxetic acid is safe and justified to differentiate between adenoma and FNH, between HCC and dysplastic nodule, or to identify small primary or secondary, malignant lesions (< 2 cm). We hope that, in the near future, the scientific societies' guidelines contemplate liver-specific contrast-enhanced MRI as a valid alternative included in the diagnostic algorithm of several focal liver lesions[24–26].

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