

原发性肝癌的MRI增强表现临床分析

张顺, 韩德义 (湖北省秭归县人民医院, 湖北 秭归县 443600)

摘要: 目的 分析肝胆期表现为乏血管低信号结节有可能转变为富血管原发性肝癌(PLC)的MRI增强影像表现。方法 135例乙型肝炎合并肝硬化患者的肝胆期增强MRI中, 发现214个乏血管低信号结节灶。分析每一个结节的大小, 在肝胆期的低信号程度(分为4度), 有无脂肪成分, 在T1加权、T2加权及弥散成像序列的信号强度。将这些变量进行多变量单变量回归分析, 来确认再生结节转变为PLC最有价值的影像特征。结果 在135例214个结节的MRI随访系列图像上, 139个结节(65.0%)无PLC形成的迹象(稳定组, 平均随访522天), 转变组75个结节(35.0%)则最终转变为富血管高信号PLC结节。单变量回归分析显示与PLC形成明显相关的为在MRI增强肝胆期结节灶的低信号程度($P = 0.001$), T2加权高信号($P = 0.001$)与弥散成像高信号($P = 0.0001$)。多变量回归分析显示首次MRI弥散成像结节高信号为PLC形成最有价值的影像特征(危害比7.44; 95%CI 4.28, 12.94)。结论 肝硬化患者MRI增强肝胆期结节灶信号最低而在弥散成像序列表现为高信号, 强烈提示富血管PLC已经形成。

关键词: 肝硬化; 肝肿瘤; 磁共振

Clinical analysis of MRI enhanced performance with primary liver cancer

ZHANG Shun, HAN De-yi (Zigui County Hospital of Hubei Province, Zigui County 443600, China)

Abstract: Objective To investigate the imaging features of hypovascular hypointense nodules on hepatobiliary phase gadoxetic acid-enhanced magnetic resonance imaging (MRI) in patients with cirrhosis that may be associated with progression to hypervascular primary liver cancer (PLC). **Methods** Our hospital institutional review board approved this retrospective study. This study included 135 patients with a diagnosis of hepatitis B-induced liver cirrhosis and 214 hypovascular hypointense nodules on hepatobiliary phase gadoxetic acid-enhanced MRI. MRI were analyzed with respect to nodule size, degree of hypointensity at hepatobiliary phase (four grades), presence of fat, and signal intensity on T1- and T2-weighted and diffusion-weighted (DW) images. Univariate and multivariate Cox regression analyses were used to identify variables that are associated with developing hypervascular PLC. **Results** On follow-up MRI, 139 nodules (65.0%) had no evidence of PLC (mean follow-up, 522 days) (group 1), but 75 (35.0%) became hypervascular PLC (mean follow-up, 388 days) (group 2). Univariable Cox analysis revealed that the degree of hypointensity on hepatobiliary phase images ($P = 0.001$) and hyperintensity on T2-weighted and DW images ($P = 0.001$, 0.0001) was significantly related to the development of hypervascular PLC. According to the multivariable Cox analysis, no other variable significantly adjusted the model once hyperintensity at initial DW imaging was already included as an associated variable, (hazard ratio, 7.44; 95%CI 4.28, 12.94; $P = 0.0001$). **Conclusions** Hyperintensity on DW images in hypovascular hypointense nodules on hepatobiliary phase gadoxetic acid-enhanced MRI in patients with cirrhosis is strongly associated with progression to hypervascular PLC.

Key words: Liver cirrhosis; Liver neoplasms; Nuclear magnetic resonance

大多数原发性肝癌(primary liver cancer, PLC)在慢性肝炎或肝硬化的基础上, 经过多个癌变过程, 完成再生结节到经典PLC的转变。再生结

节和早期肝癌在CT或MRI增强检查均可表现为等密度或低密度信号结节, 鉴别诊断很困难^[1-4]。德国拜尔医药公司生产的钆塞酸, 为目前世界上广泛应用的MRI增强造影剂, 其优点是在增强的动脉期

和间质期主要在细胞外腔隙,延迟期则为肝细胞的强化。目前公认的早期肝癌MRI增强特点是实质期比平衡期的信号更低^[5-8]。但对于早期PLC与重度再生结节组织病理学鉴别存在难度,因此确定交界性肿瘤的影像特征更具挑战性。本研究通过针对肝硬化患者的回顾性研究,分析实质期表现为乏血管低信号结节可能转变为富血管PLC的MRI增强影像表现,现报告如下。

1 资料与方法

1.1 一般资料 选择2009年9月至2013年9月本院连续收治的乙型肝炎肝硬化患者135例,包括男性96例,女性39例,年龄37~78岁,平均年龄60岁。入组患者中,120例患者有肝癌病史(手术切除50例、经动脉化疗栓塞45例、射频消融25例)。本研究已获得本院学术委员会批准。

1.2 方法

1.2.1 患者选择与分组 135例患者的MRI增强图像共发现214个低信号结节,其中87例为单个,31例2个,9例3个,3例4个,4例5个,1例5个结节灶。上述214个结节灶根据在MRI增强随访中有无变化分为稳定组及转变组。稳定组(78例)为139个结节在复查MRI(平均随访522天)增强图像低信号无变化,转变组(57例)75个结节灶在复查MRI(平均随访386天)则转变为高信号结节。入组患者在第一次和最后一次MRI增强检查期间均做过一次或多次CT扫描,但均未发现富血管高密度强化结节。

1.2.2 MRI增强技术 MRI成像平扫序列常规包括T1加权涡轮视野回波的同反相序列、屏气的多脉冲T2加权、呼吸触发的重T2加权、呼吸触发的弥散成像序列。MRI增强成像(造影剂为钆塞酸,德国拜耳医药公司生产)包括增强前、动脉期(注射造影剂开始20~35秒)、门脉期(60秒)、延迟期(3分钟)、20分钟肝胆期(HBP-hepatobiliary phase)的T1加权三维涡轮视野回波成像。钆塞酸造影剂总量每例30~50 ml(按每公斤体重0.025 mmol计算),1 ml/秒的流率注射,应用20 ml生理盐水冲洗。

1.2.3 MRI图像分析 MRI图像分析在MRI工作站完

成。两组结节均为盲向随机分组归类,以避免误差。结节的大小以20分钟HBP期的最大径为准。低信号结节按程度分为4度:1度信号高于腰大肌,2度信号等于腰大肌,3度信号低于腰大肌但高于肝内门静脉,4度信号等于或低于肝内门静脉。

1.3 统计学处理 135例患者的所有图像数据应用SAS统计分析软件包处理。采用单变量多变量回归分析的方法处理结节灶的影像表现(变量),包括结节的大小,在肝胆期的低信号-程度(分为4度),是否含有脂肪成分,在T1加权、T2加权及弥散成像序列的信号强度。 $P < 0.05$ 为差异有统计学意义。

2 结果

135例患者中,有57例的75个结节灶由乏血管低信号转变为富血管的高信号(42例1个、12例2个、3例3个结节)。第2组75个高信号结节灶证实为早期PLC,包括手术病理检查和中心组织活检者10例,经动脉化疗栓塞者37例,射频消融者10例。75个结节灶均符合世界卫生组织关于PLC影像诊断标准,在CT或MRI增强图像上具备速升速降特征。转变组75个高信号结节灶中的74个结节在T2加权和弥散成像也表现为高信号。5个高信号结节灶显示“结中结”征象。将两组结节病灶MRI表现统计处理,进行单变量多变量分析。结果显示,PLC形成最具特征的MRI表现是弥散成像序列出现高信号结节灶(进展期PLC特征性表现)。转变组75个结节灶中42个具备进展期PLC特征性表现($P = 0.001$),其统计危害比为7.44(95%CI 4.28, 12.94)。转变组有3个结节在首次MRI增强的肝胆期表现为低信号,首次弥散成像即表现为高信号,最终在全部序列成像均转变为典型PLC结节的高信号。转变组中,有8个结节灶在首次T2加权和首次弥散成像表现为高信号。转变组42个结节首次弥散成像表现为高信号,明显高于稳定组(转变组为42/75,稳定组为4/139), $P = 0.001$ 。

3 讨论

本研究显示,MRI弥散成像结节高信号是唯一能够单独提示PLC癌变形成的影像特征。第2组中

有42(42/75)个结节出现此征象,而在第1组稳定组仅有4(4/139)个,两组比较差异有显著统计学意义($P=0.0001$)。绝大多数癌变结节(74/75)在最后MRI弥散成像均表现为高信号,与文献^[8-12]报道一致。值得说明的是,少数再生结节和乏血管PLC在MRI增强肝胆期呈低信号,也可表现为MRI弥散高信号^[9,10]。准确的鉴别再生结节与早期PLC,病理组织学诊断亦有难度。即使应用多个技术参数MRI增强成像,亦难以确定HCC早期癌变的准确级别。本研究亦未能总结出鉴别再生结节与早期PLC的影像特点。目前公认的早期HCC诊断为结节必须大于1 cm且有PLC典型的动脉期强化表现^[11]。本研究显示,MRI弥散成像可作为肝脏交界性肿瘤向PLC转变的一种生物标记或重要鉴别依据。

本研究中,转变组(第2组)75个结节中有74个结节灶(98.7%)MRI弥散成像呈高信号,比文献^[12-14]报道的1.5T MRI成像的检出率[61%(11/18)、72%(79/109)、82%(89/109)]要高得多。究其原因,可能由于高场强3.0T MRI比1.5T MRI能够提供更高的信噪比和结节-组织对比度。另外,多个参数平行序列成像和多信号采集,可以减少回波长度,降低心脏运动伪影的干扰,进一步提高高信号结节检出率^[15,16]。

本研究存在的局限性:①大多数病例未经过手术证实,故不能确定HCC癌变的准确级别;②回顾性研究,研究对象的随访间隔和随访时间不一致,故不能确定早期PLC患者高危人群的随访时间。进一步研究需涵盖无PLC病史患者,前瞻性确定是否所有的HBP低信号结节在转变为PLC之前MRI弥散成像显示高信号。

在MRI增强肝胆期HBP显示乏血管低信号结节,弥散成像高信号强烈提示可能转变为富血管PLC。因此,在遇到这类患者时,有必要考虑进一步随访或创伤性检查如肝组织活检等。

参考文献

- [1] Sakamoto M, Hirohashi S, Shimosato Y. Early stages of multistep hepatocarcinogenesis: adenomatous hyperplasia and early hepatocellular carcinoma[J]. Hum Pathol,1991,22:172-178.
- [2] Kudo M. Multistep human hepatocarcinogenesis: correlation of

- imaging with pathology[J]. J Gastroenterol,2009,44(Suppl 19):112-118.
- [3] Kitao A, Zen Y, Matsui O, et al. Hepatocarcinogenesis: multistep changes of drainage vessels at CT during arterial portography and hepatic arteriography-radiologic-pathologic correlation[J]. Radiology,2009,252:605-614.
- [4] Di Martino M, Marin D, Guerrisi A, et al. Intraindividual comparison of gadoxetate disodium-enhanced MR imaging and 64-section multidetector CT in the detection of hepatocellular carcinoma in patients with cirrhosis[J]. Radiology,2010,256:806-816.
- [5] Kim YK, Kim CS, Han YM, et al. Detection of small hepatocellular carcinoma: can gadoxetic acid-enhanced magnetic resonance imaging replace combining gadopentetate dimeglumine-enhanced and superparamagnetic iron oxide-enhanced magnetic resonance imaging?[J]. Invest Radiol,2010,45:740-746.
- [6] Motosugi U, Ichikawa T, Sou H, et al. Distinguishing hypervascular pseudolesions of the liver from hypervascular hepatocellular carcinomas with gadoxetic acid-enhanced MR imaging[J]. Radiology,2010,256:151-158.
- [7] Park G, Kim YK, Kim CS, et al. Diagnostic efficacy of gadoxetic acid-enhanced MRI in the detection of hepatocellular carcinomas: comparison with gadopentetate dimeglumine[J]. Br J Radiol,2010,83:1010-1016.
- [8] Kim MJ. Current limitations and potential breakthroughs for the early diagnosis of hepatocellular carcinoma[J]. Gut Liver,2011,5:15-21.
- [9] Tanimoto A, Lee JM, Murakami T, et al. Consensus report of the 2nd International Forum for Liver MRI[J]. Eur Radiol,2009,19(Suppl 5):S975-S989.
- [10] Sandrasegaran K, Akisik FM, Lin C, et al. Value of diffusion-weighted MRI for assessing liver fibrosis and cirrhosis[J]. Am J Roentgenol,2009,193:1556-1560.
- [11] Bruix J, Sherman M, American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma: an update[J]. Hepatology,2011,53:1020-1022.
- [12] Nasu K, Kuroki Y, Tsukamoto T, et al. Diffusion-weighted imaging of surgically resected hepatocellular carcinoma: imaging characteristics and relationship among signal intensity, apparent diffusion coefficient, and histopathologic grade[J]. Am J Roentgenol,2009,193:438-444.
- [13] Kim YK, Kim CS, Han YM, et al. Detection of liver malignancy with gadoxetic acid-enhanced MRI: is addition of diffusion-weighted MRI beneficial?[J]. Clin Radiol,2011,66:489-496.
- [14] Piana G, Trinquart L, Mesquine N, et al. New MR imaging criteria with a diffusion-weighted sequence for the diagnosis of hepatocellular carcinoma in chronic liver diseases[J]. J Hepatol,2011,55:126-132.
- [15] Lee MH, Kim SH, Park MJ, et al. Gadaxetic acid-enhanced hepatobiliary phase MRI and high-b-value diffusion-weighted imaging to distinguish well-differentiated hepatocellular carcinomas from benign nodules in patients with chronic liver disease[J]. Am J Roentgenol,2011,197:W868-W875.
- [16] Nasu K, Kuroki Y, Nawano S, et al. Hepatic metastases: diffusion-weighted sensitivity-encoding versus SPIO-enhanced MR imaging[J]. Radiology,2006,239:122-130.

收稿日期: 2014-04-29