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16 层螺旋 CT 灌注成像对肝硬化血流状态的评估及与肝硬化程度 的相关性研究 *

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摘要目的:探讨 16 层螺旋 CT 灌注成像对肝硬化血流状态的评估价值及其与肝硬化程度的相关性。方法:选取 2014 年 1 月至 2016 年 1 月于我院接受诊治的肝硬化患者 126 例作为肝硬化组,根据 Child-Pugh 分级分为 A 组 (Child A 级,n=35 例)、B 组 (Child B 级,n=50 例)、C 组(Child C 级,n=41 例)。另选取同期于我院接受体检的健康人员 100 例作为对照组。应用 16 层螺旋 CT 对受试者肝脏、脾脏、主动脉以及门静脉的层面进行 CT 动态增强扫描,对比 CT 灌注参数,采用 Pearson 相关性分析分析 CT 灌 注参数与肝硬化病情严重程度的关系。结果:肝硬化组肝动脉灌注量(HAP)、肝动脉灌注指数(HPI)、肝脏血流量(TBV)以及平均 通过时间(MTT)均明显高于对照组,而门静脉灌注量(PVP)、总肝灌注量(TLP)均明显低于对照组(P<0.05)。A 组患者 HAP、HPI 均明显高于 C 组,而 PVP 与 TLP 均明显低于 C 组,差异有统计学意义(P<0.05);两组 TBV、MTT 比较无统计学差异(P>0.05); 而 A 组与 B 组相比以及 B 组与 C 组相比,各项 CT 灌注参数均无统计学差异(P>0.05)。 **H**硬化患者病情严重程度与 HAP、HPI 均呈正相关关系(P<0.05),而与 PVP、TLP 均呈负相关关系(P<0.05)。 结论:16 层螺旋 CT 灌注成像对肝硬化血流状态具有一定 的评估价值,且 CT 灌注参数的水平变化与肝硬化患者病情严重程度存在密切相关。

关键词:肝硬化;CT 灌注成像;肝脏血流状态;Child-Pugh 分级法;相关性

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Evaluation of the Flow Status of Liver Cirrhosis with 16 Slice Spiral CT Perfusion Imaging and its Correlation with the Degree of Cirrhosis*

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ABSTRACT Objective: To investigate the evaluation of the flow status of liver cirrhosis with 16 slice spiral CT perfusion imaging and its correlation with the degree of cirrhosis. **Methods:** 126 patients with liver cirrhosis who were treated in our hospital from January 2014 to January 2016 as cirrhosis group, the patients were divided into group A (Child A, n=35), group B (Child B, n=50), group C (Child C, n=43) according to Child-Pugh. Another 100 healthy people who received physical examination in our hospital were selected as the control group. 16 slice spiral CT was used to perform dynamic contrast-enhanced CT scan on the liver, spleen, aorta and portal vein of the subjects, the CT perfusion parameters were compared. Pearson correlation analysis was used to analyze the relationship between CT perfusion parameters and severity of liver cirrhosis. **Results:** The hepatic artery perfusion volume (HAP), hepatic artery perfusion index (HPI), hepatic blood flow (TBV) and mean transit time (MTT) were significantly higher in the cirrhosis group than those in the control group, portal vein perfusion (PVP) and total hepatic perfusion (TLP) were significantly lower than those in the control group C, the differences were statistically significant (P<0.05). There was no significant difference in TBV and MTT between the two groups (P>0.05). and group A compared with group B, group B compared with group C, there was no statistical difference in CT perfusion parameters (P>0.05). The severity of liver cirrhosis was positively correlated with HAP and HPI (P<0.05), but negatively correlated with PVP and TLP (P<0.05). **Conclusion:** 16 slice spiral CT perfusion imaging has certain value in evaluating the blood flow status of cirrhosis, and the level of CT perfusion parameters is closely related to the severity of cirrhosis.

Key words: Liver cirrhosis; CT perfusion imaging; Hepatic blood flow; Child-Pugh classification; Correlation

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前言

肝硬化是临床上较为常见的慢性进行性弥漫性肝病,由一种或多种病因长期、反复作用于肝脏,从而导致的肝脏疾病,其预后较差^[12]。临床上通常采用传统 CT 扫描技术进行检查,其主要是以反映肝脏解剖形态学变化为主,效果并不十分理想^[34]。至上个世纪 90 年代国外首先应用 CT 动态扫描的方法获得了肝脏实质的血管灌注量,使得 CT 灌注成像成为可能^[5]。多层螺旋 CT 灌注成像作为一种功能成像技术,主要是通过肝血流变化规律的角度对肝纤维化程度进行评估,是一种新型的肝脏储备功能评估方式^[6]。目前已有研究报道,不同程度的肝硬化 会导致患者肝脏微循环发生相应程度的改变^[7]。通过肝脏灌注状态的定量评价对肝硬化严重程度的判定和患者的治疗、预后均有极其重要的意义^[8]。鉴于此,本研究通过探讨 16 层螺旋 CT 灌注成像对肝硬化血流状态的评估及与肝硬化程度的相关性, 旨在为 16 层螺旋 CT 灌注成像在肝硬化患者中的应用提供理论依据。现作如下报道。

资料与方法

1.1 一般资料

选取 2014 年 1 月至 2016 年 1 月于我院接受诊治的肝硬 化患者 126 例为肝硬化组。纳入标准:所有患者均符合中华医 学会传染病与寄生虫病学分会、肝病学分会联合修订的病毒肝 炎防治方案中的诊断标准^[9],且经临床检查、实验室检查以及影 像学检查确诊为肝硬化。排除标准:(1) 伴有肝脏占位性病变 者;(2)门静脉栓塞或海绵样病变者;(3)脾脏切除者。其中男性 72 例,女性 54 例,年龄 33~78 岁,平均年龄(55.23± 10.44) 岁;根据 Child-Pugh 分级法将所有患者进行肝硬化程度分级, 包括 A 组 (Child-Pugh A 级)35 例、B 组 (Child-Pugh B 级)50 例、C 组(Child-Pugh C 级)41 例。另取同期我院接受体检的健 康人员 100 例作为对照组,且均经临床检查以及实验室检查确 诊无肝、肾、脾等脏器病变。其中男性 58 例,女性 42 例,年龄 37~80 岁,平均年龄(55.97± 9.46)岁。两组性别、年龄比较均 无统计学差异(P>0.05),存在可比性。两组人员均签署了知情 同意书,我院伦理委员会已批准。

1.2 Child-Pugh 分级判定标准

主要根据患者肝性脑病、腹水、胆红素、白蛋白以及凝血酶 原时间五项指标进行^[10]:无肝性脑病记1分,I~Ⅱ期肝性脑 病记2分,Ⅲ~Ⅳ期肝性脑病记3分;无腹水记1分,腹水易消 退记2分,腹水难消退记3分;胆红素低于34μmol/L记1分, 胆红素在 34~51 μmol/L 范围内记 2 分, 胆红素高于 51 μmol/L 记 3 分; 白蛋白高于 35g/L 记 1 分, 白蛋白在 28~35 g/L 记 2 分,白蛋白低于 28 g/L 记 3 分;凝血酶原时间在 15s 之 内记 1 分,凝血酶原时间在 15~17 s 之间记 2 分,凝血酶原时间在 15~17 s 之间记 2 分,凝血酶原时间高于 17s 记 3 分。五项总得分为 5~8 分记为 A 级,9~11 分 记为 B 级,11~15 分记为 C 级。

1.3 研究方法

采用 16 层螺旋 CT(GE 公司生产)选取同时含有肝脏、脾 脏、主动脉以及门静脉的层面进行 CT 动态增强扫描,其中扫 描参数如下:电压 120 kV,电流 150 mAs,层厚取 5 mm,扫描时 间 1 s。具体方式如下:于肘静脉留置 21G 静脉套管针,采用高 压注射器以 5 mL/s 的速率将 50 mL 的对比剂(Ultravist 300)注 入,随后以相同的速率将 40 mL 的生理盐水注入。在注射对比 剂前行1次扫描记为基底层面,于注射后7~40s内每2s进 行1次扫描,39~88s内每7s进行1次扫描,总共完成25次 扫描。扫描完成后将获取的图像传输至 AW4.3 工作站,并进行 数据处理,选择腹主动脉 Wie 输入动脉,输入静脉为门静脉主 干,二者感兴趣区设定为2~6 pix。其中肝实质的感兴趣区选 择应尽量大,以减少量子噪声,但切记勿达到肝脏边缘,以防止 部分容积效应的影响,同时应尽量避开大血管。最后采用去卷 积法对患者肝脏关注参数进行测量,主要包括肝动脉灌注量 (Hepatic artery perfusion, HAP)、肝动脉灌注指数(Hepatic perfusion index, HPI)、门静脉灌注量(Portal vein perfusion, PVP)、 总肝灌注量(Total liver perfusion, TLP)、肝脏血流量(TBV)以 及平均通过时间(Mean transit time, MTT)。其中 HPI 计算公式 如下 [11]:HPI=HAP/ (HAP+PVP)× 100%,TLP 计算公式如下: TLP=HAP+PVP_o

1.4 统计学方法

本研究数据均应用 SPSS25.0 统计学软件进行分析,计量 资料以(x±s)表示,多组间对比采用单因素方差进行分析,两 组数据比较应用 t 检验,计数资料以率或比表示,实施卡方检验,各项 CT 灌注参数与肝硬化患者病情严重程度的关系采用 Pearson 相关性分析,P<0.05 表明两组数据对比具有统计学意义。

2 结果

2.1 肝硬化组与对照组的各项 CT 灌注参数对比

肝硬化组 HAP、HPI、TBV、MTT 均明显高于对照组,而 PVP 与 TLP 均明显低于对照组,差异有统计学意义(P<0.05), 见表 1。

Table 1 Comparison of CT perfusion parameters between cirrhosis group and control group($\bar{x} \pm s$)						
Groups	HAP		PVP	TLP	TDV(mI/100 r)	MTT(s)
	$[mL/(min \cdot mL)]$	HPI(%)	$[mL/(min \cdot mL)]$	$[mL/(min \cdot mL)]$	1 bv(mL/100 g)	
Cirrhotic group(n=126)	15.90± 6.24	76.21± 13.04	52.11± 16.72	17.93± 10.28	13.45± 1.87	14.95± 1.60
Normal control(n=100)	10.66± 2.14	64.33± 2.97	76.18± 8.01	27.02± 8.71	11.52± 2.14	10.94± 1.12
t	8.028	8.925	13.237	14.820	7.228	21.263
Р	0.000	0.000	0.000	0.000	0.000	0.000

表 1 肝硬化组与对照组的各项 CT 灌注参数对比(x±s)

2.2 不同程度肝硬化患者各项 CT 灌注参数对比

A、B、C组HAP、HPI、PVP、TLP比较差异均有统计学意义 (P<0.05),而TBV、MTT比较差异无统计学意义(P>0.05);A 组HAP、TLP均明显低于C组,而HPI、PVP均明显高于C组 (P<0.05),TBV、MTT比较无统计学差异(P>0.05);而A组与 B组相比以及B组与C组相比,各项CT灌注参数比较均无统 计学差异(P>0.05),见表2。

Table 2 Comparison of CT perfusion parameters in patients with different degrees of cirrhosis($\bar{x} \pm s$)						
Groups	HAP	LIDI(0/)	PVP	TLP	TRV(mI/100 a)	MTT(s)
	$[mL/(min \cdot mL)]$	III I(/0)	$[mL/(min \cdot mL)]$	$[mL/(min \cdot mL)]$	1BV(IIIL/100 g)	
Group A(n=35)	13.12± 3.71*	75.48± 8.92*	63.55± 12.41*	18.38± 8.31*	13.11± 3.08	12.10± 2.33
Group B(n=50)	14.89± 5.80	71.82± 8.91	58.22± 15.80	21.88± 9.34	13.66± 3.32	12.75± 2.01
Group C(n=41)	16.85± 3.10	68.57± 8.04	52.89± 13.73	22.31± 8.20	14.73± 3.61	13.01± 1.82
F	5.264	6.137	9.615	4.137	0.786	0.913
Р	0.000	0.000	0.000	0.000	0.652	0.601

表 2 不同程度肝硬化患者各项 CT 灌注参数对比(x±s)

Note: compared with group C,*P<0.05.

2.3 CT 灌注成像各项参数与肝硬化患者病情严重程度的相关 性分析

度与 HAP、HPI 均呈正相关关系(P<0.05),与 PVP、TLP 均呈负 相关关系(P<0.05),而与 TBV、MTT 无相关性(P>0.05),见表3。

经 Pearson 相关性分析结果显示, 肝硬化患者病情严重程

表 3	CT 灌汪	成像各项参	数与肝硬化	患者病情ど	"重桯度的	り相关性分	析

CT partician parameters	Severity of cirrhosis			
er perfusion parameters –	r	Р		
НАР	0.684	0.000		
HPI	0.613	0.000		
PVP	-0.724	0.000		
TLP	-0.739	0.000		
TBV	0.127	0.836		
MTT	0.104	0.845		

3 讨论

随着医学影像技术的发展,CT 灌注成像技术开始在临床 上广泛应用,并已成为临床上的一种新型功能成像技术^[12,13]。 与以往监测肝外血液循环系统不同,CT 灌注成像技术可定量 测量组织的绝对灌注值,从而有效反映组织水平上的血流量变 化情况,不但可及时发现并鉴别病变性质,同时对早期病变部 分尚未出现形态学变化而仅有血流状态改变等特征具有一定 的临床价值^[14,15]。而肝硬化主要病理改变包括肝细胞弥漫性变 性坏死、结节状再生以及结缔组织增生等,上述改变反复交错 进行,从而导致肝小叶结构以及血液循环被逐渐改建,随着病 情的进展会发生一系列不同程度的门静脉高压,而门静脉对肝 脏的灌注减小^[16,17]。微循环的血流动力学状态也被称为灌注,肝 脏血流状态能在一定程度上反应肝脏的血流动力学和功能情 况,其灌注指标包括 HAP、HPI、TBV、MTT、PVP、TLP 等,通过 对肝硬化患者肝脏血流状态的评估,对肝硬化的判定和患者的 治疗、预后均有极其重要的意义^[18-20]。

本研究结果显示, 肝硬化组 HAP、HPI、TBV、MTT 均明显

高于对照组,而 PVP 与 TLP 均明显低于对照组(P<0.05)。表明 了肝硬化患者各项 CT 灌注参数存在明显变化,其中主要原因 在于: 肝脏的双重供血结构可促使 TBV 在正常生理范围内进 行自身调节,从而有利于肝脏总灌注血流量可在一定范围内维 持稳定[21,22]。而在发生肝硬化后,由于肝脏结构以及微循环发生 变化,从而使得肝脏的血流阻力上升,PVP减少,进一步导致 HAP 的增加^[23,24]。然而,由于 HAP 的增加无法完全代偿 PVP 的 降低,因此 TLP 依旧呈下降趋势[25,26]。临床工作中可通过计算各 项 CT 灌注参数水平,进一步为肝硬化的诊断提供参考依据。 从不同程度肝硬化患者各项 CT 灌注参数水平对比来看,A 组 患者 HAP、HPI 均明显高于 C 组, PVP 与 TLP 均明显低于 C 组 (P<0.05);两组 TBV、MTT 比较无统计学差异(P>0.05);而 A 组与B组相比以及B组与C组相比, 各项CT灌注参数均无 统计学差异(P>0.05)。这提示了随着肝硬化病情逐渐恶化, PVP、TLP 均呈逐渐下降趋势。分析原因,作者认为可能与随着 病情逐渐加剧,肝窦受到的肝硬化结节压迫逐渐增加,从而促 使大量的交通支形成,肝脏血流灌注阻力逐渐增加有关[27.28]。另 外,本文结果还显示了肝硬化患者病情严重程度与 HAP、HPI 水平均呈正相关(P<0.05),与 PVP、TLP 均呈负相关关系(P<0. 05),而与 TBV、MTT 无相关性(P>0.05)。这也证实了 CT 灌注 成像应用于肝硬化患者中,有助于早期诊断以及评估肝硬化严 重程度,从而可为临床治疗方案的制定提供指导作用^[23.30]。

综上所述,16 层螺旋 CT 灌注成像对肝硬化血流状态具有 一定的评估价值,且 CT 灌注参数的水平变化与肝硬化患者病 情严重程度存在密切相关。临床工作中可通过对 CT 灌注成像 检查,对肝硬化患者进行早期诊断以及病情评估。

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