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128层螺旋CT肺动脉造影对急性肺栓塞患者栓塞程度和右心功能的评估价值研究*

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摘要 目的：探讨128层螺旋CT肺动脉造影(CTPA)对急性肺栓塞(APE)患者栓塞程度和右心功能的评估价值。**方法**：选取2016年7月到2018年6月期间在我院行CTPA检查确诊并接受治疗的APE患者100例记为观察组，根据观察组患者的病情将其分为高危组(57例)和非高危组(43例)，同时根据观察组患者肺栓塞部位及预后将患者分为中心肺栓塞死亡组(8例)、中心肺栓塞存活组(38例)、周围肺栓塞组(54例)。另选择同期于我院进行CTPA检查的无肺栓塞患者50例记为对照组。记录所有患者的右心功能参数[右心室短轴最大径(RVMSA)、左心室短轴最大径(LVMSA)以及二者的比值(RV:LV)]，计算APE患者的CT肺动脉阻塞指数，并分析APE患者CT肺动脉阻塞指数与右心功能指标的相关性。**结果**：观察组的RVMSA、RV:LV均明显高于对照组(P<0.05)，高危组的CT肺动脉阻塞指数、RVMSA、RV:LV均明显高于非高危组(P<0.05)。中心肺栓塞死亡组的CT肺动脉阻塞指数、RVMSA、RV:LV均明显高于中心肺栓塞存活组和周围肺栓塞组，中心肺栓塞存活组的CT肺动脉阻塞指数、RVMSA、RV:LV均明显高于周围肺栓塞组(P<0.05)。经Pearson相关分析显示，APE患者CT肺动脉阻塞指数与RVMSA、RV:LV均呈正相关(P<0.05)，与LVMSA无明显的相关性(P>0.05)。**结论**：CTPA检查可有效评估APE患者的栓塞程度和右心功能，且栓塞程度与右心功能存在相关性，CTPA检查有助于APE患者的诊断和病情评估。

关键词：多层螺旋CT肺动脉造影；急性肺栓塞；栓塞程度；右心功能；评估价值
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Value of 128-slice Spiral CT Pulmonary Angiography in Evaluating the Degree of Embolism and Right Ventricular Function in Patients with Acute Pulmonary Embolism*

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ABSTRACT Objective: To explore the value of 128-slice spiral CT pulmonary angiography (CTPA) in evaluating the degree of embolism and right ventricular function in patients with acute pulmonary embolism (APE). **Methods:** A total of 100 patients with APE, who were diagnosed and treated by CTPA in the First People's Hospital of Ziyang from July 2016 to June 2018, were chosen as observation group. According to the patient's condition, they were divided into high-risk group (57 cases) and non-high-risk group (43 cases). At the same time, according to the location and prognosis of pulmonary embolism, the patients in the observation group were divided into three groups: central pulmonary embolism death group (8 cases), central pulmonary embolism survival group (38 cases) and peripheral pulmonary embolism group (54 cases). Another 50 patients without pulmonary embolism, who underwent CTPA examination in the hospital during the same period, were chosen as control group. The right ventricular function parameters [maximum diameter of right ventricular short axis (RVMSA), maximum diameter of left ventricular short axis (LVMSA) and their ratios (RV: LV)] were recorded in all patients. And CT pulmonary occlusion index in the patients with APE was calculated. The correlation between CT pulmonary artery occlusion index and right ventricular function index in APE patients was analyzed. **Results:** The RVMSA and RV: LV in the observation group were significantly higher than those in the control group (P<0.05). The CT pulmonary artery occlusion index, RVMSA and RV: LV in high-risk group were significantly higher than those in non-high-risk group (P<0.05). The CT pulmonary artery occlusion index, RVMSA and RV: LV in the central pulmonary embolism death group were significantly higher than those in the central pulmonary embolism survival group and peripheral pulmonary embolism group. The CT pulmonary artery obstruction index, RVMSA and RV: LV in the central

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pulmonary embolism survival group were significantly higher than those in peripheral pulmonary embolism group (P<0.05). Pearson analysis showed that CT pulmonary artery obstruction index was positively correlated with RVMSA and RV: LV in APE patients (P<0.05), but no obvious correlation with LVMSA (P>0.05). **Conclusion:** CTPA examination can effectively evaluate the degree of embolism and right heart function in APE patients, and the degree of embolism is correlated with right heart function. CTPA examination is helpful in diagnosing and evaluating APE patients.

Key words: Multi-slice spiral CT pulmonary angiography; Acute pulmonary embolism; Degree of embolism; Right heart function; Evaluation value

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前言

急性肺栓塞(Actue pulmonary embolism,APE)是指来自右心或静脉系统的血栓栓子堵塞肺动脉,导致患者出现肺循环障碍的一类疾病,APE 发病率高，其病死率居于心肌梗死和恶性肿瘤之后,位于第三位[1-3]。APE 患者易并发右心功能不全,严重时可导致患者出现右心衰竭，这是导致 APE 患者死亡的重要因素之一[4-6],因此临床非常重视 APE 患者右心功能的监控。尽早诊断、准确的评估患者病情的严重程度,对于临床制定治疗方案、评估患者的预后有重要的意义,肺动脉造影检查(Digital subtract angiography,DSA)是临床诊断 APE 的金标准,但 DSA 为有创性检查,并且可引起部分并发症,因此目前主要用于介入治疗,而不是常规确诊检查[7]。随着 CT 扫描技术的不断发展,螺旋 CT 肺动脉造影 (spiralCTpulmonaryangiography,CTPA) 在 APE 的诊断上得到越来越多的应用,其具有快速、有效、无创等特点,已成为临床诊断 APE 的首选影像学方式[8-10]。目前较多关于 CTPA 对 APE 诊断价值方面的研究，但关于 CTPA 对 APE 患者右心功能的评估价值方面研究较少。本研究旨在探讨 CTPA 对 APE 患者栓塞程度和右心功能的评估价值,以期为临床提供参考,现作如下报道。

1 资料与方法

1.1 一般资料

选取 2016 年 7 月到 2018 年 6 月期间在我院行 CTPA 确诊并接受治疗的 APE 患者 100 例记为观察组,纳入标准:① 所有患者均符合欧洲心脏学会制定的关于 APE 的诊断标准[11];② 入院前未接受溶栓或抗凝等方式治疗;③ 发病至就诊时间≤ 10 d;④ 患者及其家属对本次研究知情同意,并签署同意书。排除标准:① 有心肌梗死病史者;② 合并间质性肺病、双肺炎症以及慢性肺疾病者;③ 先天性心脏病者;④ 合并肥厚型或扩张型心肌病、瓣膜性心脏病、糖尿病心肌病、高血压性心脏病者。100 例 APE 患者中男性 56 例,女性 44 例,年龄 25-73 岁,平均年龄(56.24± 12.31)岁,根据患者的病情将其分为高危组和非高危组,高危标准如下[9]:① 心动过速,且心率超过 100 次 /min;② 动脉收缩压低于 90 mmHg，或与基础血压相比下降超过 40 mmHg;③ 血氧分压低于 60 mmHg;④ 呼吸急促,且频率超过 25 次 /min;具备以上 1 项或多项表现即定义为高危,纳入到高危组(57 例),其余患者纳入到非高危组(43 例)。同时根据患者肺栓塞部位及预后将其分为中心肺栓塞死亡组 8 例、中心肺栓塞存活组 38 例、周围型肺栓塞组患者 54 例。另选取同期在我院行 CTPA 检查的无肺栓塞患者 50 例作为对照组，其中男性 27 例,女性 23 例,年龄 22-71 岁,平均年龄(57.89± 12.11)岁。观察组和对照组之间的一般资料比较无统计学差异(P>0.05)。

1.2 检查方法

采用 128 层 CTPA(GE OPTⅠMA 660)对所有患者进行常规肺动脉造影,有效电流设置为 200 mA,电压设置为 120 kV,0.5 s/ 圈,螺距为 0.625,采用双筒高压注射器经肘前静脉注射碘海醇注射液(350 mgI/mL),剂量为 70 mL 左右,注射速率为 5 mL/s，注射完成之后再以相同的注射速率注射生理盐水 30 mL,延迟扫描,触发阈值为 100HU,位置设在主肺动脉。让患者在每次扫描时都注意屏气,屏气时间在 6s 左右。扫描完成后重组图像,层间距 0.625 mm,层厚 0.625 mm。在 3 min 后进行心电门控肺动脉造影,电流设置为 280-380 mA,电压设置为 120 kV,0.5 s/ 圈,螺距为 0.625,采用双筒高压注射器注射碘海醇注射液(350 mgI/ml)80 mL 左右,注射速率为 5 mL/s,注射完成之后再以相同的注射速率注射生理盐水 30 mL,延迟扫描,触发阈值为 100 HU,位置设在主肺动脉,扫描参数如下:电流设置为 500-800 mA,电压设置为 120 kV,探测器单圈旋转时间为 350 ms,覆盖范围 4 cm，根据患者心率将时间分辨率设置为 85-180 ms。采用 Mastoora 肺栓塞影像学评分标准进行评分，根据公式计算 CT 肺动脉阻塞指数,CT 肺动脉阻塞指数 = 肺动脉管腔阻塞评分 /155× 100%。在横轴位 CT 图像上测量右心室短轴最大径(Maximum diameter of right ventricular short axis,RVMSA)、左心室短轴最大径（Maximum diameter of left ventricular short axis,LVMSA)、并计算二者的比值(RV:LV)。

1.3 统计学方法

采用 SPSS19.0 进行统计分析。计量资料采用均数± 标准差($\bar{x}$± s)表示,多组比较采用单因素方差分析,两两比较采用 t 检验,计数资料用百分数(%)表示,采用卡方检验,采用 Pearson 相关性分析法分析相关性,P<0.05 为差异有统计学意义。

2 结果

2.1 观察组和对照组的右心功能参数比较

观察组和对照组的 LVMSA 比较差异无统计学意义(P>0.05),观察组的 RVMSA、RV:LV 均明显高于对照组(P<0.05),见表1。

2.2 高危组和非高危组的 CT 肺动脉阻塞指数、右心功能参数比较

高危组和非高危组的 LVMSA 比较差异无统计学意义(P>0.05)，高危组的 CT 肺动脉阻塞指数、RVMSA、RV:LV 均明显高于非高危组(P<0.05),见表 2。

表 1 观察组和对照组的右心功能参数比较($\bar{x}\pm s$)

Table 1 Comparison of right ventricular function parameters between observation group and control group($\bar{x}\pm s$)

Groups	n	RVMSA(cm)	LVMSA(cm)	RV:LV
Control group	50	4.02± 0.71	4.55± 0.81	0.91± 0.13
Observation group	100	4.62± 0.98	4.36± 0.94	1.15± 0.14
t		3.851	1.220	7.176
P		0.000	0.224	0.000

表 2 高危组和非高危组的 CT 肺动脉阻塞指数、右心功能参数比较($\bar{x}\pm s$)

Table 2 Comparison of CT pulmonary artery occlusion index and right ventricular function parameters between high-risk group and non-high-risk group($\bar{x}\pm s$)

Groups	n	CT pulmonary artery occlusion index(%)	RVMSA(cm)	LVMSA(cm)	RV:LV
High-risk group	57	24.89± 8.26	5.18± 1.01	4.26± 0.98	1.22± 0.18
Non-high-risk group	43	8.93± 1.28	3.88± 0.68	4.50± 0.96	1.05± 0.12
t		30.356	7.282	1.223	5.357
P		0.000	0.000	0.224	0.000

2.3 中心肺栓塞死亡组、中心肺栓塞存活组、周围肺栓塞组的 CT 肺动脉阻塞指数、右心功能参数比较

三组的 LVMSA 比较差异无统计学意义(P>0.05),三组的 CT 肺动脉阻塞指数、RVMSA、RV:LV 比较差异有统计学意义(P<0.05),中心肺栓塞死亡组的 CT 肺动脉阻塞指数、RVMSA、RV:LV 均明显高于中心肺栓塞存活组和周围肺栓塞组,中心肺栓塞存活组的 CT 肺动脉阻塞指数、RVMSA、RV:LV 均明显高于周围肺栓塞组(P<0.05),见表 3。

表 3 中心肺栓塞死亡组、中心肺栓塞存活组、周围肺栓塞组的CT 肺动脉阻塞指数、右心功能参数比较($\bar{x}\pm s$)

Table 3 Comparison of CT pulmonary artery obstruction index and right ventricular function parameters among central pulmonary embolism death group, central pulmonary embolism survival group and peripheral pulmonary embolism group($\bar{x}\pm s$)

Groups	n	CT pulmonary artery obstruction index(%)	RVMSA(cm)	LVMSA(cm)	RV:LV
Central pulmonary embolism death group	8	35.15± 4.81#*	6.98± 1.12#*	4.20± 0.98	1.81± 0.19#*
Central pulmonary embolism survival group	38	24.39± 1.32#	4.79± 0.73#	4.25± 0.91	1.34± 0.12#
Peripheral pulmonary embolism group	54	11.01± 1.21	4.17± 0.42	4.47± 0.83	0.92± 0.11
F		592.793	20.759	0.452	8.764
P		0.000	0.000	0.637	0.000

Note: Compared with central pulmonary embolism survival group, *P<0.05; Compared with peripheral pulmonary embolism group, #P<0.05.

2.4 APE 患者 CT 肺动脉阻塞指数与右心功能参数的相关性分析

经 Pearson 分析显示,APE 患者 CT 肺动脉阻塞指数与 RVMSA、RV:LV 均呈正相关(r=0.612、0.532,P=0.000、0.000),与 LVMSA 无明显的相关性(r=-0.212,P=0.078)。

3 讨论

APE 是一种严重的心血管系统疾病,患者主要表现为咳血、胸痛、呼吸困难等,具有较高的死亡率[12-14]。APE 患者由于栓子堵塞肺动脉,导致管腔狭窄,引起血流动力学改变,使得肺血管阻力突然增加,患者右心室容量和压力也随之增加,同时室壁张力增加、肌纤维拉伸,患者右心室的收缩功能受到明显的影响,除此之外,右心室壁张力增加会导致右心室心肌氧耗增多,使得心肌缺血,进一步加重右心功能不全[15-17],由此可见,APE 患者易并发右心功能不全。右心功能不全是临床对 APE 患者进行危险分层的重要指标,同时也是导致患者死亡的重要原因。何梅等人的研究显示[18],APE 患者的右心功能与患者的住院时间和全因死亡率密切相关,因此准确地评估 APE 患者的右心功能具有重要的临床意义。CTPA 具有无创、图像清晰、扫描速度快、经济等特点,通过图像可直观判断 APE 患者的栓塞程度、累及的部位和范围,是目前临床诊断 APE 的重要检查技术[19-21],但 CTPA 能否有效评估患者的右心功能还有待研究。

RVMSA 是反映右心室形态学变化的指标,而右心功能不全者右心室扩张、左心充盈不良可导致 RV:LV 数值增加,通过 RV:LV 可判断患者右心功能受损的严重程度[22-24]。本研究结果

显示，观察组的 RVMSA、RV:LV 均明显高于对照组，这说明 APE 患者存在明显的右心功能损伤，提示临床应重视患者的右心功能监测。CT 肺动脉阻塞指数是定量分析 APE 患者栓塞程度的一项指标[25,26]。本研究结果显示，高危组的 CT 肺动脉阻塞指数、RVMSA、RV:LV 均明显高于非高危组，而中心肺栓塞死亡组、中心肺栓塞存活组、周围肺栓塞组的 CT 肺动脉阻塞指数、RVMSA、RV:LV 逐渐降低，这说明不同病情和预后的 APE 患者的栓塞程度和右心功能存在差异，通过 CTPA 检查可较明显的发现这些差异，利于病情的评估。此外通过相关性分析发现，CT 肺动脉阻塞指数与 RVMSA、RV:LV 均呈正相，说明可通过 CT 肺动脉阻塞指数来评估 APE 患者的右心功能。CTPA 可通过肺血管及分支的成像观察 APE 患者的栓塞程度，并且还可显示心脏和血管的形态学改变，进而评估右心功能[27]。CT 肺动脉阻塞指数可反映 APE 患者的栓塞肺动脉的支数，并可以评价肺动脉管腔阻塞的程度，栓子堵塞肺动脉导致的肺血管阻力增加是引发右心功能不全的重要原因，栓塞程度越严重，患者的肺血管阻力变化越明显，进而加重对右心功能的影响[28,29]。邢媛媛等人采用心脏彩超检测了 APE 患者的右心功能参数，结果发现 CT 肺动脉阻塞指数与患者的右心功能参数密切相关[30]，与本研究结果相似。

综上所述，CTPA 可有效评估 APE 患者的栓塞程度，并可较好地评估患者的右心功能，临床可通过 CTPA 诊断患者病情，为疾病的治疗提供准确的依据。然而本研究纳入的病例数较少，研究结果是否具有代表性尚需扩大样本量进行进一步的验证。

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