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彩色多普勒超声定量评价冠心病患者左心房、左心室功能的诊断意义

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摘要 目的:评价超声二维斑点追踪显像技术(2D-STI)对冠心病(CAD)患者左心房、左心室功能的临床应用价值。**方法:**选取2015年12月至2016年12月因CAD在我院住院就诊患者30例作为实验组,另选取同期健康体检者30例为对照组,采用彩色多普勒超声仪应用2D-STI测量左心室各节段心内膜下心肌、中层心肌、心外膜下心肌纵向应变(TLSendo, TLSmid, TLSepi),左室心内膜下心肌、中层心肌、心外膜下心肌整体纵向应变(GLSendo, GLSmid, GLSepi),左心室收缩期左心房应变率(SRs),左心室舒张早期左心房峰值应变率(SRe)和左心室舒张晚期左心房应变率(SRa),并计算其平均值(mSRs, mSRe, mSRa)。比较两组之间的数据。**结果:**实验组 TLSendo 为 $(21.45 \pm 9.02)\%$, TLSepi 为 $(15.22 \pm 5.12)\%$, 低于对照组的 $(26.55 \pm 7.59)\%$ 、 $(18.79 \pm 3.77)\%$, 差异有统计学意义($P < 0.05$)。实验组 GLSendo 为 $(21.07 \pm 3.12)\%$, GLSmid 为 $(18.11 \pm 2.57)\%$, GLSepi 为 $(15.79 \pm 3.11)\%$, 均低于对照组的 $(23.55 \pm 2.59)\%$ 、 $(20.82 \pm 2.04)\%$ 、 $(18.07 \pm 2.00)\%$, 差异有统计学意义($P < 0.05$)。实验组 mSRs 和 mSRe 分别为 (3.41 ± 0.68) 、 (-3.09 ± 0.82) , 低于对照组的 (4.55 ± 0.69) 、 (-3.67 ± 1.30) ; 实验组 mSRa 为 (-4.47 ± 1.33) , 高于对照组的 (-3.52 ± 1.44) , 差异均有统计学意义($P < 0.05$)。同一检查者两次测量结果的相关系数为 $r=0.935$, $P < 0.05$; 不同检查者的测量结果相关系数为 $r=0.931$, $P < 0.05$ 。**结论:**2D-STI 可以定量评价 CAD 的左心功能,其表现主要为左室各层心肌收缩功能降低,左心房储备功能降低。

关键词:二维斑点追踪显像;冠状动脉粥样硬化性心脏病;左心房功能;左心室功能

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Diagnostic Significance of Color Doppler Ultrasound Quantitative Assessment of Left Atrial and Left Ventricular Function in Patients with Coronary Atherosclerotic Disease

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ABSTRACT Objective: To assess the clinical value of two-dimensional speckling-tracking imaging (2D-STI) in the diagnosis of left atrial and left ventricular function in patients with coronary atherosclerotic disease (CAD). **Methods:** A total of 30 patients with CAD, who were admitted to Armed Police Corps Hospital of Hubei from December 2015 to December 2016, were chosen as experimental group; another 30 healthy subjects were selected as control group. Color Doppler ultrasound 2D-STI was used to measure the longitudinal strain of left ventricular segmental subendocardial myocardium, midmyocardium and subepicardial myocardium (TLSendo; TLSmid; TLSepi), the global longitudinal strain of left ventricular segmental subendocardial myocardium, midmyocardium and subepicardial myocardium (GLSendo; GLSmid; GLSepi), left ventricular systolic left atrial strain rate (SRs), left ventricular early diastolic left atrial peak strain rate (SRe) and left ventricular late diastolic left atrial strain rate (SRa), and the mean values were calculated (mSRs; mSRe; mSRa). The data were compared between the two groups. **Results:** The TLSendo [$(21.45 \pm 9.02)\%$] and TLSepi [$(15.22 \pm 5.12)\%$] of the experimental group were lower than those [$(26.55 \pm 7.59)\%$ and $(18.79 \pm 3.77)\%$] of the control group, the differences were statistically significant ($P < 0.05$). The GLSendo [$(21.07 \pm 3.12)\%$], GLSmid [$(18.11 \pm 2.57)\%$] and GLSepi [$(15.79 \pm 3.11)\%$] of the experimental group were lower than those [$(23.55 \pm 2.59)\%$, $(20.82 \pm 2.04)\%$, and $(18.07 \pm 2.00)\%$] of the control group, the differences were statistically significant ($P < 0.05$). The mSRs (3.41 ± 0.68) and mSRe (-3.09 ± 0.82) of the experimental group were lower than those [(4.55 ± 0.69) and (-3.67 ± 1.30)] of the control group; the mSRa (-4.47 ± 1.33) of the experimental group was higher than that [(-3.52 ± 1.44)] of the control group, the differences were statistically significant ($P < 0.05$). The correlation coefficient between the two measurements of the same examiner was $r=0.935$ ($P < 0.05$), the correlation coefficient of the different examiners measurement results was $r=0.931$ ($P < 0.05$). **Conclusion:** 2D-STI can be used to quantitatively evaluate left ventricular function in patients with CAD. The main manifestations are the decrease of myocardial contractile function and the reduction of the left atrial reserve function in the left ventricle.

Key words: Two-dimensional speckling-tracking imaging; Coronary atherosclerotic cardiopathy; Left atrial function; Left ventricular function

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前言

冠心病(coronary atherosclerotic disease, CAD)是临床最常见的心血管病之一,在疾病的发生发展过程中,会发生室壁运动减弱、消失、矛盾运动、心室腔变性等病理变化,其中左心的表现尤为明显^[1,2]。临床上以冠状动脉造影作为 CAD 确诊的金标准,但是其属于有创检查,操作不便且昂贵,并不适合广泛应用^[3]。二维斑点追踪显像技术(two-dimensional speckling-tracking imaging, 2D-STI)是近年来超声领域的新技术,被应用于评价心脏收缩功能、同步性和扭转运动等方面,具有方便,便于随访等优点^[4,5]。本研究应用 2D-STI 评价 CAD 患者的左心室和左心房功能,探讨其临床应用价值。

1 资料与方法

1.1 研究对象

选取 2015 年 12 月至 2016 年 12 月因 CAD 在我院住院就诊患者 30 例作为实验组,其中男性 17 例,女性 13 例,年龄 48~76 岁,平均年龄(57.2± 8.1)岁。CAD 诊断标准为:冠状动脉造影显示左主干和 3 条心外膜下冠状动脉及其大分支任意一段直径狭窄≥ 50%。排除标准为:先天性心脏病或心脏病手术后心包积液,心肌传导性疾病,心脏瓣膜病。另选取同期健康体检者 30 例为对照组,其中男性 17 例,女性 13 例,年龄 46~75 岁,平均年龄(56.8± 8.3)岁,均无心脏病病史及临床症状,经过心电图和超声心动图检查正常。受试者均签署实验知情同意书,实验已通过医院临床伦理委员会审核。

1.2 实验方法

受检者左侧卧位或平卧位接受超声心动图检查,同步连接心电图,嘱受试者平静呼吸,常规测量后分别存取心尖四腔观,

心尖两腔观和心尖左心室长轴观至少 3 个连续心动周期的二维图像并存储,帧率>60 帧/s。将存储图像导入 Q-analysis 软件进行图像分析,调节软件将心肌分为心内膜下心肌,中层心肌和心外膜下心肌三层,得出左室各节段心内膜下心肌、中层心肌、心外膜下心肌纵向应变(TLSendo, TLSmid, TLSepi)以及上述各层的整体纵向应变(GLSendo, GLSmid, GLSepi)。再将取样点置于左心房各壁中段,追踪斑点运动,获得各点纵向应变率曲线,测量左室收缩期左房应变率(SRs),左室舒张早期左房峰值应变率(SRe)和左室舒张晚期左房应变率(SRa),得出其平均值(mSRs, mSRe, mSRa)。所有指标均在不同的心动周期测量 3 次,取平均值。

1.3 重复性测定

一周后选择另两名有经验医师分别从实验组和对照组中各随机抽取 10 例样本重新进行测定,每位医师每个指标均检测两次。然后对同一检查者两次测量结果和不同检查者的测量结果进行重复性和差异性分析。

1.4 统计学分析

使用 SPSS17.0 统计软件进行分析。计量资料采用($\bar{x} \pm s$)表示,组间比较采用 t 检验,重复性和差异性分析采用相关分析。以 P<0.05 为差异有统计学意义。

2 结果

2.1 两组左心室心肌纵向分层应变参数比较

实验组 TLSendo 为(21.45± 9.02)%, TLSepi 为(15.22± 5.12)%,低于对照组的(26.55± 7.59)%、(18.79± 3.77)%,差异有统计学意义(P<0.05)。TLSmid 组间差异无统计学意义(P>0.05),见表 1。

表 1 两组左心室心肌纵向分层应变参数比较

Table 1 Comparison of left ventricular myocardial longitudinal stratification strain parameter between two groups

Groups	TLSendo(%)	TLSmid(%)	TLSepi(%)
Experimental group	21.45± 9.02*	24.02± 6.53	15.22± 5.12*
Control group	26.55± 7.59	25.91± 8.70	18.79± 3.77
t	2.370	0.952	3.075
P	0.021	0.345	0.003

Note: Compared with the control group, *P<0.05.

2.2 两组左室整体纵向分层应变参数比较

实验组 GLSendo 为(21.07± 3.12)%, GLSmid 为(18.11± 2.57)%, GLSepi 为(15.79± 3.11)%,均低于对照组的(23.55±

2.59)%、(20.82± 2.04)%、(18.07± 2.00)%,差异有统计学意义(P<0.05),见表 2。

表 2 两组左心室整体纵向分层应变参数比较

Table 2 Comparison of left ventricles overall longitudinal layered strain parameters between two groups

Groups	GLSendo(%)	GLSmid(%)	GLSepi(%)
Experimental group	21.07± 3.12*	18.11± 2.57*	15.79± 3.11*
Control group	23.55± 2.59	20.82± 2.04	18.07± 2.00
t	3.350	4.524	3.377
P	0.001	0.000	0.001

Note: Compared with the control group, *P<0.05.

2.3 两组左房应变率比较

实验组 mSRs 和 mSRe 分别为(3.41± 0.68)、(-3.09± 0.82), 低于对照组的(4.55± 0.69)、(-3.67± 1.30); 实验组

mSRa 为(-4.47± 1.33), 高于对照组的(-3.52± 1.44), 差异均有统计学意义(P<0.05),见表 3。

表 3 两组左房应变率的比较

Table 3 Comparison of left room strain rate between two groups

Groups	mSRs	mSRe	mSRa
Experimental group	3.41± 0.68*	-3.09± 0.82*	-4.47± 1.33*
Control group	4.55± 0.69	-3.67± 1.30	-3.52± 1.44
t	6.445	2.067	-2.655
P	0.000	0.043	0.010

Note: Compared with the control group, *P<0.05.

2.4 重复性检验

同一检查者两次测量结果的相关系数为 $r=0.935$, $P=0.004$; 不同检查者的测量结果相关系数为 $r=0.931$, $P=0.000$ 。说明 2D-STI 技术可重复性较好。

3 讨论

CAD 患者心室功能减弱的同时影响心房功能, 心房在心脏循环过程中发挥重要作用, 左心房对心脏功能的影响重大, 包括三大功能: 储器功能、通道功能和辅泵功能, 这三个功能共同发挥作用, 保障心脏的正常功能^[6,7]。CAD 是指由于冠状动脉结构或功能异常导致心肌缺血缺氧而发生的心脏疾病, 其发生发展和遗传、生活习惯、环境等因素密切相关^[8]。目前我国 CAD 的发病率和死亡率处于上升阶段, 尤其是中青年患病率和死亡率上升趋势明显, 每年死于 CAD 的人数超过 100 万^[9]。现阶段 CAD 的诊断手段包括心电图、超声心动图、组织多普勒成像技术、核素心肌灌注显像、心脏磁共振检查、冠状动脉多层 CT 血管造影及冠状动脉造影^[10,11]。其中冠状动脉造影可以达到诊断和治疗同步, 是 CAD 确诊的金标准。但是由于检查有创伤和放射性、价格昂贵, 操作复杂这些问题的存在, 并不能普遍用于临床检查中^[12]。因此, 如何能够安全快捷地早期发现、早期诊断 CAD, 成为了近年来研究的热点^[13]。当 CAD 患者出现心肌供血功能异常时, 局部心肌缺血能够不同程度降低心肌功能, 心室肌发生缺血时, 会损伤左心室的舒张功能, 延长舒张期, 增加左心房的代偿性收缩功能以保证其左心室收缩功能正常, 因此准确评价左心房的功能具有重要的意义^[14,15]。

传统超声心动图只能反映长轴的纵向心肌和短轴的环形心肌的影像特点, 并不能反映心肌细胞自身特性, 导致其临床应用受到限制^[16]。本研究使用的 2D-STI 技术是近年来超声领域的新技术, 利用小于入射超声束波长的细小结构在二维图像中产生散射形成的回声斑点定位, 并利用图像处理软件追踪斑点位置的移动, 来判断心脏肌肉组织运动的轨迹^[17,18]。被用于评价心肌的收缩舒张, 扭转运动及应变性等方面, 具有无角度和负荷依赖性的特点^[19]。有研究发现^[20-23], 2D-STI 能够检测到心肌组织的早期缺血症状, 在常规二维超声的基础上, 2D-STI 的分析软件能够自动分析出检测组织的运动状态, 计算出各检测区的变化特点, 分别从径向、纵向、旋转和圆周全面分析心脏的运动状态, 并不会受到周围组织和心脏运动的影响, 能够全面客观地反映心肌组织的状况^[24]。通过测量心肌应变变量反映心肌的变形能力和心肌的收缩和舒张功能^[25,26], 本研究结果表明 CAD 患者的 GLSendo, GLSmid, GLSepi 均较对照组降低, 提示 CAD 患者左室全层心肌收缩形变及功能降低, 左室整体收缩功能受损。实验组 TLSendo 和 TLSepe 较对照组降低, 但是 TLSmid 差异无统计学意义, 提示 CAD 节段纵向收缩功能受损

主要存在于左室内膜下和左室外膜下, 可能是由于中层心肌纤维为环形, 在纵向应变对缺血的敏感性不高^[27]。本研究结果中, CAD 患者的 mSRs 和 mSRe 降低, 提示左心房的储备功能和被动射血功能降低。主要是由于 CAD 患者心肌缺血导致心室顺应性降低, 从而引起左心房残余血量增加, 同时心室舒张功能减低, 房室压差缩小, 最终导致左心房被动射血功能减低导致的^[28,29]。而 mSRa 增加则提示左心房通过增加主动射血量来代偿心肌缺血导致的左心室舒张功能障碍, 以维持左心室的心输出量^[30]。

综上所述, 2D-STI 技术能够从心肌收缩舒张和应变性方面较为准确评价左心房和左心室功能, 具备安全、可重复性好等优点。但是目前数据分析仍然是脱机分析, 不能够即时给出检查结果, 而且对于超声图像清晰度和帧率要求较高, 心内膜显示必须清晰。目前想要在临床广泛应用仍然需要改进。

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