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心肌带收缩率与急性心肌梗死患者左心室收缩功能关系

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摘要 目的:急性前壁心肌梗死明显影响室间隔收缩率和左心室射血分数(left ventricular ejection fraction LVEF)。本文旨在探讨心肌带降段及升段收缩率与急性前壁心肌梗死患者 LVEF 的相关性。**方法:**收集 2015 年 4 月-2017 年 2 月在心内科住院的急性前壁心肌梗死患者 36 例,正常对照组患者 39 例。所有患者取左心室长轴 M 型超声心动图,测量室间隔收缩率、升段收缩率及降段收缩率。心肌梗死左心室射血分数采用双平面 Simpson's 法计算。**结果:**与正常对照组相比,心肌梗死组患者舒张末期心肌带升段厚度没有统计学差异($P=0.69$),收缩末期升段厚度($P=0.014$)更薄、升段收缩率($P<0.01$)明显降低;心肌梗死组舒张末期降段厚度($P<0.01$)更薄、收缩末期降段厚度($P<0.01$)更薄、降段收缩率($P<0.01$)明显降低;心肌梗死组左心室射血分数与降段收缩率($r^2=0.13$, $P=0.026$)、室间隔增厚率($r^2=0.19$, $P<0.01$)呈正相关,与升段收缩率没有相关性($P>0.05$)。正常对照组左心室射血分数与室间隔增厚率、降段增厚率及升段增厚率无相关性。经过相关分析,筛选出与心肌梗死 LVEF 的相关因素,进一步经逐步回归分析,得多元线性回归方程为 $LVEF=48.206+18.914*LVDD(\text{cm})-25.414*LVSD(\text{cm})$ 。**结论:**急性前壁心肌梗死室间隔降段收缩率明显受损,与左心室射血分数降低有关。多元线性回归方程可估算前壁心肌梗死 LVEF。

关键词:急性前壁心肌梗死;心肌带;收缩率;左心室射血分数;线性回归

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Assessment of Ventricular Myocardial Band and Left Ventricular Systolic Function in Acute Myocardial infarction Patients

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ABSTRACT Objective: Acute anterior myocardial infarction obviously influence the thickening rate of myocardial septum and left ventricular ejection fraction (LVEF). The purpose of this study was to investigate the value of descending and ascending segments thickening rate of helical ventricular myocardial band in the evaluation of left ventricular ejection fraction in acute anterior myocardial infarction patients. **Methods:** 36 acute anterior myocardial infarction patients and 39 normal patients were involved in during 2015.04-2017.02. The ascending and descending segments were identified by echogenic bright line in M mode in the ventricular septum. The LVEF of acute anterior myocardial infarction patients were measured by Simpson's method. **Results:** There was no statistical difference in end diastolic ascending segments length ($P=0.69$) between myocardial infarction group and control group. However, the end systolic ascending segments length ($P=0.014$), ascending segments thickening rate ($P<0.01$), the end diastolic descending segments length ($P<0.01$), the end systolic descending segments length ($P<0.01$), descending segments thickening rate ($P<0.01$) in myocardial infarction group were significantly lower than the control group. Left ventricular ejection fraction had positive correlation with descending segments thickening rate ($r^2=0.13$, $P=0.026$) and interventricular septum thickening rate ($r^2=0.19$, $P<0.01$), but not with ascending segments thickening rate ($P>0.05$). While there had no correlation between left ventricular ejection fraction and descending segments thickening rate, ascending segments thickening rate and interventricular septum thickening rate in control group. The model of LVEF prediction was scores of $LVEF=48.206+18.914*LVDD(\text{cm})-25.414*LVSD(\text{cm})$. **Conclusions:** Left ventricular descending segments thickening rate significantly injured in acute anterior myocardial infarction, which have correlation with left ventricular ejection fraction decreased. The model of LVEF prediction can estimate the LVEF of myocardial infarction.

Key words: Acute anterior myocardial infarction; Helical ventricular myocardial band; Thickening rate; Left ventricular ejection fraction; Multivariate regression

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前言

心肌带理论最早是由 Torrentguasp^[1]教授提出,认为心脏具有螺旋状结构,分为基底环和尖端环,尖端环可以分为降段和升段。急性前壁心肌梗死容易累及室间隔、引起心力衰竭。高长清^[2,3]等人通过动物实验发现心肌带降段和收缩功能有关,升段和舒张功能有关^[4,6]。超声心动图可显示室间隔降段和升段,目前心肌梗死准确 LVEF 都是通过 Simpson's 法计算。本研究通过超声心动图对急性心肌梗死后室间隔降段和升段的运动分析,探讨降段和升段收缩率与急性前壁心肌梗死左心室 LVEF 相关性研究,同时分析急性前壁心肌梗死 LVEF 多因素回归方程。

1 材料与方法

1.1 一般资料

选取 2015 年 4 月 -2017 年 2 月在我院心内科住院的急性前壁心肌梗死患者 36 例,其中男性 32 例,女性 4 例,平均(57.6±10.0)岁。入选标准:按照 2015 年《急性 ST 段抬高型心肌梗死诊断和治疗指南》^[7]的诊断标准,冠状动脉造影提示冠状动脉狭窄,心脏超声提示前壁心肌梗死累及室间隔,心脏超声透声良好,窦性心律。排除标准:未累及前间隔的心肌梗死,左心室室壁瘤,超声心动图透声质量不佳,≥ 中度二尖瓣和主动脉瓣反流,心房颤动,心脏超声提示其他器质性心脏病。选取在我院门诊就诊的正常对照组 45 例,其中男性 19 例,女性 26 例,平均(52.9±13.4)岁。

1.2 超声心动图

采用飞利浦 IE33 彩色多普勒超声诊断仪行超声心动图检查。患者行侧卧位,平静呼吸,同步记录心电图,测量左心室舒张末期径(LVDD),左心室收缩末期径(LVSD),室间隔舒张末期厚度(IVSD),室间隔收缩末期厚度(IVSS),室间隔收缩

率(IVSR)=[室间隔舒张末期厚度(IVSD)-室间隔收缩末期厚度(IVSS)]/[室间隔舒张末期厚度(IVSD)*100%,室间隔舒张末期降段心肌带厚度(Descending segment, DESD),室间隔收缩末期降段心肌带厚度(Descending segment, DESS),降段收缩率(DESr)=[室间隔舒张末期降段心肌带厚度(DESCD)-室间隔收缩末期降段心肌带厚度(DESS)]/[室间隔舒张末期降段心肌带厚度(DESCD)*100%,室间隔舒张末期升段心肌带厚度(Ascending segment, ASCD),室间隔收缩末期升段心肌带厚度(Ascending segment, ASCS),升段收缩率(ASCR)=[室间隔舒张末期升段心肌带厚度(ASCD)-室间隔收缩末期升段心肌带厚度(ASCS)]/[室间隔舒张末期升段心肌带厚度(ASCD)*100%,左心房前后径(LAD),左心室射血分数(LVEF,双平面 SIMPSON 法)。取二尖瓣水平 M 型超声心动图,通过室间隔强回声带,将室间隔分为靠近左心室的降段和靠近右心室的升段,左心室舒张末期取心电图 R 波顶点,收缩末期取 T 波终点,分别测量舒张末期降段厚度和升段厚度,以及收缩期降段厚度和升段厚度。每组测量三次,取平均值,分别计算降段和升段收缩率。

1.3 统计学分析

数据采用 SPSS19.0 统计软件分析,采用 GraphPad 软件进行图片制作。计量资料以($\bar{x} \pm s$)表示,两组间参数比较采用 t 检验;计数资料以频数或率表示,采用 χ^2 检验分析。左心室射血分数采用 Logistic 多元线性回归分析。相关性分析采用线性相关性分析。 $P < 0.05$ 为差异具有统计学意义。

2 结果

2.1 室间隔心肌带

图 1 示左心室长轴切面二尖瓣水平 M 型超声心动图,根据心肌带结构理论,室间隔内强回声带(白色箭头)将室间隔分为两部分,靠近左心室为降段,靠近右心室为升段。

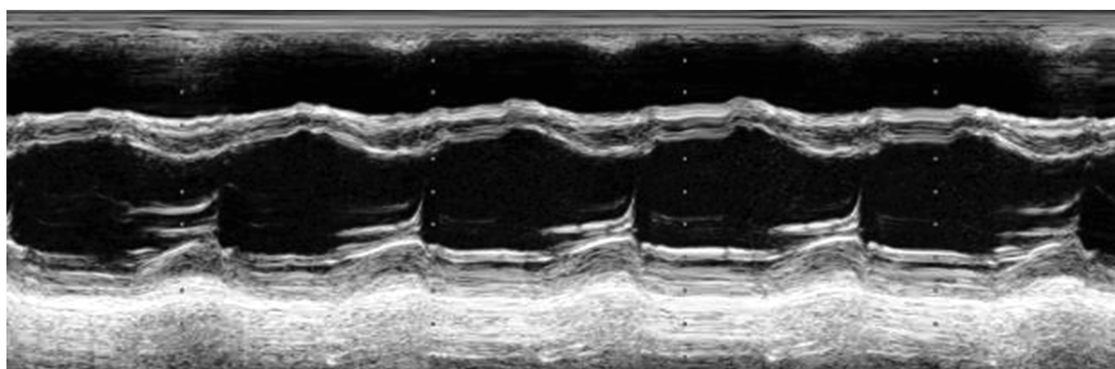


图 1 M 型超声将室间隔分为降段和升段

Fig.1 Interventricular septum was separated into descending and ascending segment by M mode ultrasound

2.2 心肌梗死组与对照组资料对照

与对照组相比,心肌梗死组舒张末期降段厚度明显更小(0.37 cm±0.10 cm VS 0.50 cm±0.14 cm $P=0.000$),而舒张末期升段没有统计学差异($P=0.69$)。心肌梗死组收缩期降段和升

段厚度均小于对照组。心肌梗死组室间隔收缩率、降段收缩率、升段收缩率均小于正常对照组。心肌梗死组左心房前后径,左心室舒张末期径显著大于对照组,左心室射血分数显著低于对照组。

表 1 心肌梗死组与对照组超声心动图资料对比

Table 1 Comparison of echocardiography in myocardial infarction group and control group

	Myocardial infarction group(n=36)	Control group(n=39)	P
Ascending segment			
systolic(cm)	0.41± 0.11	0.47± 0.10	0.014
diastolic(cm)	0.34± 0.09	0.35± 0.07	0.69
rate(%)	0.21± 0.22	0.36± 0.18	0.001
Descending segment			
systolic(cm)	0.44± 0.14	0.74± 0.18	0.000
diastolic(cm)	0.37± 0.10	0.50± 0.14	0.000
rate(%)	0.17± 0.20	0.51± 0.25	0.000
IVS			
systolic(cm)	0.85± 0.17	1.2± 0.20	0.000
diastolic(cm)	0.72± 0.10	0.85± 0.16	0.000
rate(%)	0.18± 0.16	0.44± 0.14	0.000
LVEF(cm)	41.4± 3.7	61.0± 2.2	0.000
LVDD(cm)	5.8± 0.3	4.9± 0.4	0.000
LA(cm)	4.1± 0.4	3.7± 0.6	0.001
AGE(year)	57.6± 10.0	52.9± 13.4	0.083

2.3 心肌梗死组及对照组收缩率与 LVEF 关系

图 2 显示心肌梗死组室间隔收缩率、降段收缩率和左心室射血分数呈线性正相关($P=0.008$, $r^2=0.19$, $P=0.026$, $r^2=0.13$), 而

升段收缩率与 LVEF 无统计学差异($P=0.10$)。图 3 显示正常对照组室间隔收缩率、降段收缩率和升段收缩率与左心室射血分数无统计学差异。

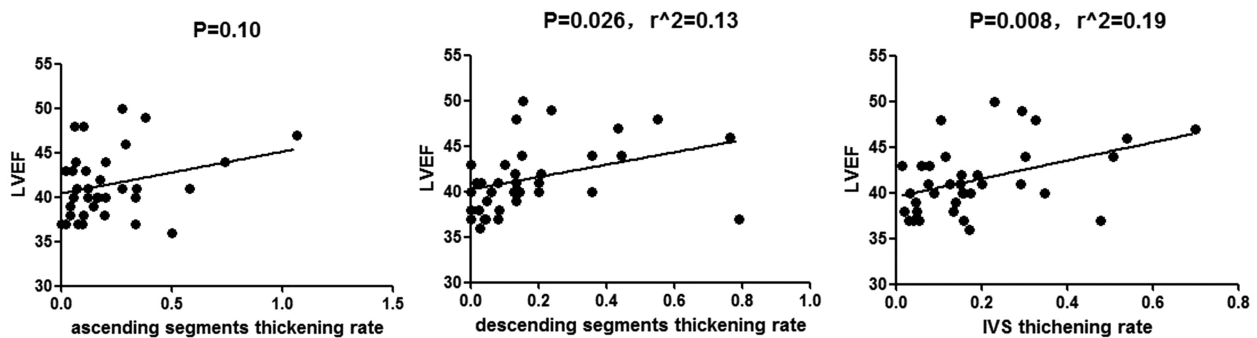


图 2 心肌梗死组室间隔收缩率、升段收缩率及降段收缩率与 LVEF 相关性

Fig. 2 Correlation of segment thickening rate and LVEF in myocardial infarction group

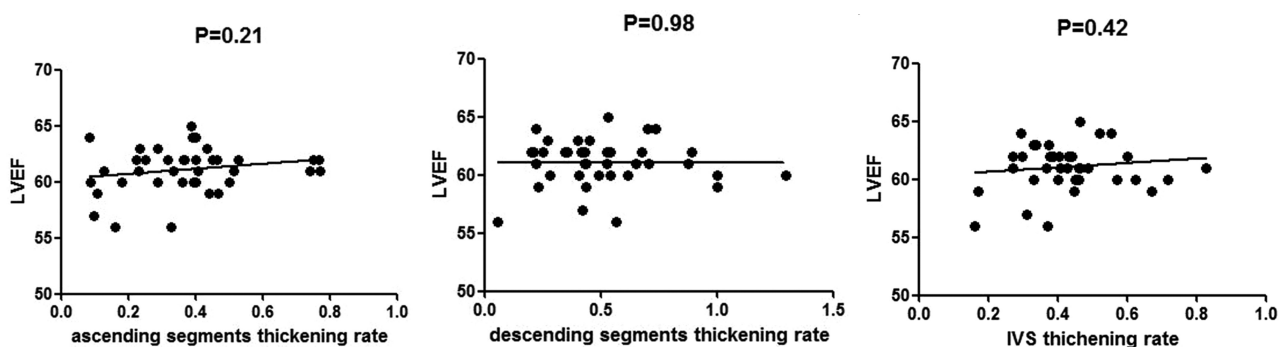


图 3 正常对照组室间隔收缩率、升段收缩率及降段收缩率与 LVEF 相关性

Fig.3 Correlation of segment thickening rate and LVEF in normal group

2.4 急性前壁心肌梗死 LVEF 多元线性回归关系

总共有 5 个自变量被选入模型: 室间隔增厚率, LVDD, LVDS, 升段收缩率, 降段收缩率。进一步经逐步回归分析, 得多元线性回归方程为 $LVEF = 48.206 + 18.914 * LVDD (cm) - 25.414 * LVDS (cm)$ 。在该模型的该模型中的标准偏回归系数中, LVDS(-2.316)的绝对值最大, 可以认为他对 LVEF 影响最大。同时, LVDS 的非标准或标准偏回归系数均为负值 (-25.414, -2.316), 认为左心室收缩末期内径越大, LVEF 越小。

表 2 LVEF 多重线性回归分析模型的系数 *

Table 2 Multivariate linear regression analysis of LVEF

	Unstandardized coefficients		Standardized coefficient	t	P
	B	std.Error	Beta		
constan	48.206	5.197		9.276	0.000
IVSR	-0.614	13.866	-0.028	-0.044	0.965
LVDD	18.914	2.117	1.618	8.936	0.000
LVDS	-25.414	1.912	-2.316	-13.292	0.000
ASCR	0.454	5.820	0.029	0.078	0.938
DESR	1.337	7.582	0.078	0.176	0.862

*Dependent Variable: LVEF

3 讨论

心肌带结构最早是由 Torrentguasp^[1]教授提出的, 其通过大量的动物以及人体心脏解剖提出心肌是由一个螺旋状结构的心肌带结构构成, 分为基底环和尖端环, 尖端环分为降段和升段。超声心动图显示室间隔内有强回声带, 将室间隔分为升段和降段。基于心肌带结构理论, Liu^[8]等人通过心内外膜斑点追踪技术评估心肌梗死心肌存活性。一般室间隔增厚率: 正常 >30%, 室壁运动减弱 <30%, 室壁无运动 <10%。关于室间隔心肌带升段和降段的增厚率并无文献报道, 我们的正常对照组升段收缩率为 $36 \pm 18\%$, 降段收缩率为 $51 \pm 25\%$, 降段收缩能力较强。

Boettler^[5]等人也发现心肌梗死后影响心肌带结构。高长清^[2,3]等人通过动物实验发现, 降段主要和左心室收缩有关, 升段主动收缩和心脏主动充盈有关。因此心肌梗死影响升段时也会导致左心室充盈压增高, 影响血液回流。考虑冠状动脉是垂直分布于心肌, 心内膜下心肌容易受到心肌缺血的影响^[9], 因此及早开通梗死的冠状动脉, 可以挽救更多的降段心肌, 保障左心室收缩功能, 同时挽救升段心肌, 使得左心室主动松弛功能, 减少左室内舒张末期压力。心肌运动包括环向运动, 纵向收缩。广泛前壁心肌梗死累及室间隔运动。我们的研究发现心肌梗死组降段舒张期及收缩期增厚率均明显下降, 同时心肌梗死组降段收缩率与 LVEF 呈正相关, 而升段收缩率与 LVEF 无相关性, 考虑降段收缩能力与心肌梗死左心室射血分数明显有关。Ma^[10]等人发现心内膜下纵向心肌纤维较多, 并且通过应变发现其在收缩功能中起主要作用。心肌带结构不仅可以解释心肌梗死后室间隔运动下降, 还可能和室间隔夹层有一定关系, 考虑血液不断进入被撕裂的室间隔心肌带结构有关^[11,12]。Lee^[13]等人发表一例因右冠窦破入室间隔, 引起室间隔夹层导致左心室流出道梗阻^[13]。不同室间隔夹层预后也不一样, 心尖部夹层预后较好, 而在室间隔夹层预后则不佳^[14]。

考虑到左心室射血分数是心肌梗死预后的一个重要因

素^[15], 因此超声心动图作为心肌梗死后结构异常首选检查, 其不仅可评估收缩功能, 还可评估舒张功能。超声心动图通过测量左心室舒张末期容积(EDV)和收缩末期容积(ESV)计算左心室射血分数。超声心动图还可通过对左心室各节段进行评分计算室壁运动指数, 判断心肌梗死范围, 左心室节段运动异常越多, 左心室收缩功能越差^[16]。超声心动图评估心肌梗死后左心室射血分数, 一般采用 SIMPSON 法。更加准确测量左心室射血分数, 可采用三维超声心动图方法^[17,18], 但是这个技术对超声机器硬件、超声图像质量、以及操作人员要求较高。我们的研究通过对前壁心肌梗死 LVEF 进行多元线性回归分析, 通过测量左心室收缩末期内径和左心室舒张末期内径, 比较方便的得出无室壁瘤的前壁心肌梗死 LVEF 的数值, 目前急诊床旁超声心动图应用广泛^[19,20], 这个多元线性回归分析尤其适用于急诊快速判断左心室射血分数。

广泛前壁心肌梗死累及室间隔, 导致心肌收缩率下降。在我们的研究中, 通过 M 型超声心动图对室间隔心肌带分层, 心肌梗死后室间隔降段和升段运动明显下降, 降段的运动下降和左室射血分数下降明显有关。通过多因素回归分析可以方便计算前壁心肌梗死左心室射血分数。

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