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·临床研究·

组织运动二尖瓣环位移技术评价缺血性二尖瓣反流*

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摘要 目的：探讨缺血性二尖瓣反流与二尖瓣环位移的关系。**方法：**2011 年 1 月至 2012 年 12 月前壁或下壁心肌梗死的患者 107 人和 40 名健康志愿者，分为反流组和无反流组。应用超声心动图组织运动二尖瓣环位移技术检测他们的左室射血分数、二尖瓣环最大位移、二尖瓣环中点位移及其占左室长径百分比。**结果：**反流组与无反流组二尖瓣环位移测值均低于对照组，差别有统计学意义（P＜0.05）。前壁心梗反流组和下壁心梗反流组二尖瓣环最大位移较相应的无反流组减低，差别有统计学意义（P＜0.05）；二尖瓣环前壁 - 下壁中点位移及其所占左室长径百分比减少，与无反流组相比差别有统计学意义（P＜0.01）。**结论：**应用二尖瓣环运动自动追踪技术能够更准确地测量二尖瓣环运动，可以用来评价缺血性二尖瓣反流，为定量分析左心功能提供了新的检查方法。

关键词：超声心动描技术；组织运动二尖瓣环位移；心肌缺血；二尖瓣反流

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Evaluation of Ischemic Mitral Regurgitation by Automated Motion Tracking of Mitral Annular Displacement*

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ABSTRACT Objective: To investigate the correlation between ischemic mitral regurgitation（IMR）and mitral annular displacement. **Methods:** A total of 107 patients with anterior myocardial infarction(AMI) or inferior myocardial infarction (IMI), and 40 volunteers from January 2011 to December 2012 were divided into ischemic mitral regurgitation (IMR) group and no-ischemic mitral regurgitation (NIMR) group to detect their degree of left ventricular ejection fraction, mitral annular displacement (MAD), maximum displacement of the midpoint (MAD mid) and the percentage of MAD Mid in length diameter of ventriculus sinister (MAD mid%) by echocardiography and tracking of mitral annular displacement (TMAD). **Results:** TMAD measurements significantly reduced in patients of NIMR group or IMR group compared with that of the control group (P＜0.05). MAD measurements significantly reduced in patients of IMR-AMI group and IMR- IMI group compared with that of the NIMR group (P＜0.05). MAD mid and MAD mid% of anterior-inferior wall significantly reduced in patients of IMR-AMI group and IMR-IMI group compared with NIMR group. **Conclusions:** It can more accurately measure the mitral valve annulus movement parameters by application of TAMD, which can be used to evaluate the ischemic mitral regurgitation. It provides a new inspection method for the quantitative analysis of left heart function.

Key words: Echocardiography; Tracking of mitral annular displacement (TMAD); Myocardial ischemia; Mitral Regurgitation

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前言

缺血性二尖瓣反流（Ischemic Mitral Regurgitation IMR）是指二尖瓣结构正常，由于心肌缺血导致的左室结构和功能发生改变而引起的二尖瓣反流。它是冠心病的常见并发症之一，其发生率已超过风湿性心脏病造成的二尖瓣关闭不全。缺血性二尖瓣反流可以引起严重的血液动力学改变，导致患者远期生存率明显降低[1,2]。组织运动二尖瓣环位移 (tracking of mitral annular displacement, TMAD) 技术是以组织斑点追踪技术为基础，在二维灰阶超声图像上半自动跟踪二尖瓣环相对于左室心尖部运动的轨迹，通过二尖瓣环位移曲线来定量分析二尖瓣环的运动特点[3]。本研究旨在应用组织二尖瓣环位移追踪技术评价缺血性二尖瓣反流与二尖瓣环位移的关系。

1 材料与方法

1.1 病例资料

2011 年 1 月至 2012 年 12 月在我院确诊为前壁心肌梗死或下壁心肌梗死的患者，共计 107 人。根据超声心动图检查结

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果分为两组:(1)单纯心肌梗死无二尖瓣反流(no-ischemic mitral regurgitation,NIMR)组,患者 51 例,年龄 35 岁 -76 岁;(2)心肌梗死合并二尖瓣反流 (ischemic mitral regurgitation, IMR)组,患者 56 例,年龄 42 岁 -75 岁。每组再根据心肌梗死部位不同分为前壁(anterior myocardial infarction,AMI) 组和下壁(inferior myocardial infarction, IMI) 组。要求所有患者均为窦性心律,二尖瓣结构正常,排除二尖瓣器质性疾病、心肌病等。

对照组:随机选取年龄匹配的健康志愿者 40 例,年龄 30 岁 -73 岁。心电图、超声心动图以及实验室检查排除其他器质性疾病。

1.2 研究方法

美国 Philips iu22 型彩色多普勒超声诊断仪,S5-l 探头,频率 1.0-5.0 MHz。此仪器配有 QLab7.0 工作站,可以进行组织运动二尖瓣环位移 (tracking of mitral annular displacement, TMAD)追踪分析。

所有入选患者均进行常规超声心动图检查,同步连接心电图。患者左侧卧位,先行常规超声扫查,通过多切面观察二尖瓣, 除外器质性病变;Simpson 双平面法测量左室射血分数(Left ventricular ejection fraction,LVEF)。常规检查结束后重新调整图像,待图像显示清晰后分别采集并存储包括心尖四腔心切面,心尖两腔心切面和心尖左室长轴心切面的动态图像。将存储的图像传输至 QLab7.0 工作站进行后处理分析。

1.3 图像分析

应用 QLab7.0 工作站的高级组织运动量化分析(Advanced Tissue Motion Quantification,TMQA)软件进行脱机分析[4],选择 TMAD 选项,将取样点分别置于左室侧壁、后间隔、前壁和下壁的二尖瓣环位置以及左室心尖部,软件将自动生成二尖瓣环相对于心尖部运动的同步位移曲线;分别测定四个位点的二尖瓣环最大位移(mitral annular displacement,MAD);心尖四腔心切面和两腔心切面测定侧壁与室间隔、前壁与下壁位瓣环位点的二尖瓣环中点位移(maximum displacement of the midpoint connecting,MAD mid)及其占左室长径百分比(the percentage of the maximum displacement of the midpoint accounted in length diameter of ventriculus siniste,MAD mid %)。

1.4 统计学方法

采用 SPSS 18.0 统计软件进行分析。所有计量资料参数采用均数± 标准差($\bar{X}$± S)来表示,组间比较采用配对 t 检验,以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 一般资料

各组患者详细资料见表 1。各组间年龄、性别比较差别无统计学意义($P>0.05$)。

表 1 各组患者基本信息

Table 1 Basic information of patients in different group

	Normal control group	NIMR group	IMR group
Age,yrs(mean ± SD)	58.69± 12.01	61.37± 9.39	62.82± 8.36
Male	25	32	36
Female	15	19	20
AMI	-	22	25
IMI	-	29	31

2.2 心肌梗死组与对照组 TMAD 参数比较

反流组中左室射血分数减低,与对照组相比差别有统计学意义($P<0.05$);反流组与无反流组之间左室射血分数差别无统计学意义($P>0.05$)。反流组与无反流组的二尖瓣环最大位移、二尖瓣环中点位移及其占左室长径百分比减少,与对照组相比差别有统计学意义($P<0.05$);反流组各数值低于无反流组,二者相比差别有统计学意义($P<0.05$),其中室间隔、前壁和下壁减少显著($P<0.01$)。见图 1,表 2。

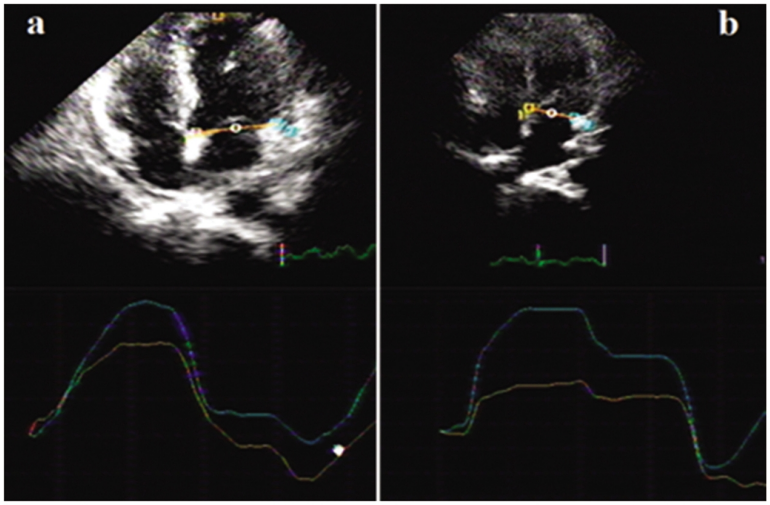

图 1 a 正常对照组二尖瓣环最大位移,b 前壁心梗反流组二尖瓣环最大位移

Fig.1 a MAD in the normal control group,b MAD in the NIMR-AMI group

表 2 各组 TMAD 测值比较

Table 2 Comparison of TMAD measurements in the groups

	Normal control group	NIMR group	IMR group
LVEF(%)	61.74± 5.65	56.45± 6.15	54.81± 6.71*
MAD(mm)			
IVS	12.17± 1.76	7.35± 0.84*	5.36± 0.65*▲▲
LW	13.92± 1.73	9.49± 0.96*	8.94± 0.95*
AW	13.39± 1.97	7.59± 0.86*	5.76± 0.87*▲▲
IW	12.88± 2.07	8.02± 0.67*	5.64± 0.38*▲▲
MAD mid(mm)			
IVS - LW	13.31± 1.46	8.01± 0.65*	7.02± 0.71*▲
AW-IW	12.63± 1.95	6.56± 0.73*	5.51± 0.59*▲▲
MAD mid%			
IVS - LW	17.85± 1.93	9.57± 0.54*	9.08± 0.93*
AW-IW	16.95± 2.51	8.64± 0.65*	7.73± 0.72*

注:*P＜0.05 与对照组相比;▲P＜0.05, ▲▲ P＜0.01 与 NIMR 组相比。

Note: *P＜0.05 compared with the control group; ▲P＜0.05,▲▲P＜0.01 compared with the NIMR group.

2.3 不同心肌梗死部位反流组与无反流组参数比较

在前壁心肌梗死和下壁心肌梗死患者中,反流组的二尖瓣环最大位移、二尖瓣环中点位移及其占左室长径百分比小于无反流组,与其相比差别有统计学意义(P＜0.05),其中以前壁组室间隔和侧壁点 MAD、两组的前壁 - 下壁 MAD mid%减少为著(P＜0.01)(见图 2-4)。

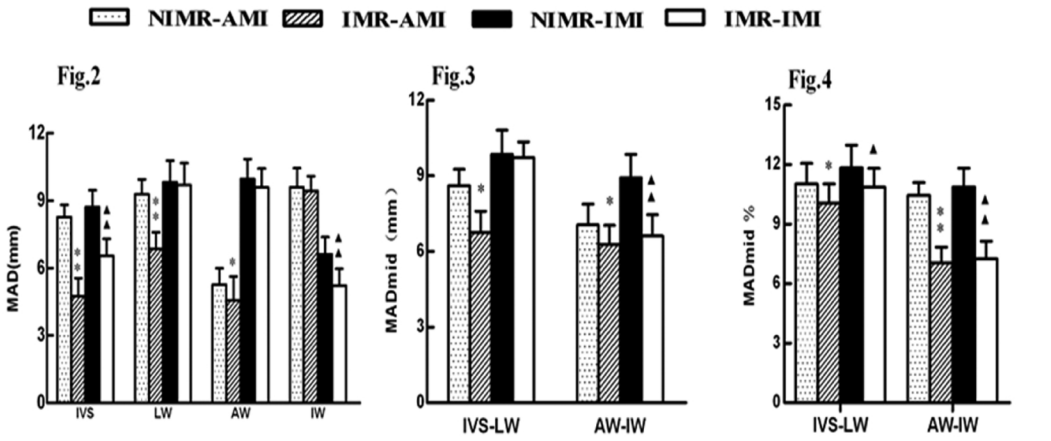

图 2 前壁心梗组和下壁心梗组 MAD 参数比较

Fig.2 Comparison of MAD easurements in the AMI and IMI group

图 3 前壁心梗组和下壁心梗组二尖瓣环中点位移比较

Fig.3 Comparison of MAD mid in the AMI and IMI group

图 4 二尖瓣环中点位移占左室长径百分比的比较

Fig.4 Comparison of MAD mid % in the AMI and IMI group

注:*P＜0.05,** P＜0.01 与 NIMR-AMI 组相比;▲P＜0.05,▲▲ P＜0.01 与 NIMR-IMI 组相比

Note: *P＜0.05, ** P＜0.01 comparing with the NIMR-AMI group; ▲P＜0.05,▲▲P＜0.01comparing with the NIMR-IMI group

3 讨论

二尖瓣环是左心房和左心室之间的胶原纤维环状结构。二尖瓣环形态、大小、运动的改变都可以引起二尖瓣装置的几何构型发生变化,导致瓣膜反流[5,6]。心肌梗死后左室重构及二尖瓣形态学改变与二尖瓣反流关系密切[7],一旦出现二尖瓣反流可导致左室扩大,加重反流,从而形成恶性循环,影响预后。三维超声心动图的研究发现,当发生缺血性二尖瓣反流时,二尖瓣立体构型发生平面化改变,瓣环扩张[8,9]。二尖瓣环的运动能够反映左室心肌纤维在左心室长轴方向和舒缩运动的变化特征[10],而心肌收缩力的变化也会导致瓣环的运动异常,二尖瓣环的形态对于维持二尖瓣的启闭和左心室的收缩舒张功能具有重要意义[11,12]。TMAD 技术是定量分析二尖瓣环运动参数的新技术,以往多用于左心室的收缩和舒张功能的研究[13,14]。研究表明应用 TMAD 技术获得的二尖瓣环参数在评价左室收缩功能方面的准确性较高, 其准确性优于磁共振和 M 型超声心动图所测得的射血分数[15-17]。而缺血性二尖瓣反流时二尖瓣环参数的变化则研究得较少。

二尖瓣环纤维是呈纵向走行的心肌纤维,二尖瓣叶、左心房和左心室组织附着于此,并且这种纵向排列贯穿于整个左心室,心肌的收缩牵拉二尖瓣环是二尖瓣环运动的源动力,心肌收缩使二尖瓣环朝向心尖运动,当心肌舒张时,瓣环相对上移从而远离心尖部位,因此,瓣环的运动与心肌收缩力特别是左心室纵行的心肌纤维收缩力密切相关[18]。本研究表明,心肌梗

死患二尖瓣环位移减少,梗死部位和相邻室壁的瓣环位移减少最明显,并且以反流组为著(P< 0.05)(见图 2)。考虑心肌缺血或发生梗死后,左室纵行纤维运动幅度相应地减低,心肌的收缩力明显减弱, 对二尖瓣环的牵拉能力减弱, 导致 " 马鞍型 " 的二尖瓣装置变得扁平,二尖瓣环运动幅度减低,位移变小。同时,局部心肌发生梗死后,相邻心肌受累处于缺血状态,心肌的收缩力量较弱, 因此表现为梗死相邻部位瓣环运动也相应减弱。当前壁心肌缺血范围较大累及侧壁时,侧壁的前组乳头肌同时受累,会加重二尖瓣瓣环的运动异常;后组乳头肌位于左室下壁, 当下壁心肌发生梗死时直接累及后组乳头肌的功能,也会加重瓣环的运动异常[19]。本研究还显示心梗反流组二尖瓣环中点位移及其占左室长径百分比均小于其余各组(P< 0.05)(图 3,4),说明二尖瓣环连线的中点及其占左室长径百分比也能够反映瓣环整体的运动情况,与文献结果[20]相似。

总之,二尖瓣环运动自动追踪技术操作简便,应用此技术能够更准确地测量二尖瓣环的运动,可以用来评价缺血性二尖瓣反流。并且由于二尖瓣环的运动可以反映左室心肌收缩力,为定量分析左心功能提供了新的检查方法。

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细胞而言仍然较小，不足以使单个核细胞总数发生明显改变，达不到统计学意义；(2)并发症因素。不论1型还是2型糖尿病都会引发复杂的并发症，炎症的发生可伴有单个核细胞激活增加或抑制浸润而减少，本文样本为2型糖尿病总体内随机采样，可能因不同病理状态下细胞本身的应激反应不同而不能反映某种单一变化趋势。

本研究中外周血单个核细胞绝对值计数与2型糖尿病之间无明显相关性，但与患病不伴并发症或伴有某一特定并发症的患者仍不能排除存在相关可能，需继续收集2型糖尿病并发血管硬化的典型病例来进一步分析外周血单个核细胞数目及功能与疾病的相关性，期待能够成为2型糖尿病动脉硬化早期监测的常规检测指标。

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