

· 论 著 ·

实时三维超声心动图评价心肌梗死合并室壁瘤患者左心室容积及射血分数

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[摘要] **目的:**探讨实时三维超声心动图(RT-3DE)定量评价心肌梗死合并室壁瘤患者左心室容积及射血分数的可行性及准确性。**方法:**应用 RT-3DE、常规超声心动图双平面 Simpson's 法和 M 型超声心动图 Teichholz 法测量 23 例心肌梗死合并室壁瘤患者左心室舒张末期容积(LVEDV)、收缩末期容积(LVESV)、每搏量(SV)及射血分数(EF),以左心室造影为参考标准。**结果:**RT-3DE 测量所得 LVEDV、LVESV、SV、EF 与左心室造影结果具有良好的相关性, r 分别为 0.92、0.90、0.88、0.91 (P 均 <0.001),LVEDV、LVESV、SV、EF 测值均较左心室造影略小,但两者无显著性差异。二维超声心动图的双平面 Simpson's 法与左心室造影具有良好的相关性, r 分别为 0.85、0.87、0.86、0.91(P 均 <0.001),LVEDV、LVESV、SV、EF 测值均较左心室造影小,双平面 Simpson's 法与左心室造影测得的 LVEDV、LVESV 之间有显著差异($P<0.05$),但两者的 SV、EF 之间无差异;M 型超声心动图 Teichholz 法与左心室造影结果具有一定的相关性, r 分别为 0.73、0.71、0.70、0.65(P 均 <0.05),LVEDV、LVESV、SV、EF 测值均较左心室造影大($P<0.05$ 或 $P<0.01$)。**结论:**RT-3DE 较常规超声心动图能更准确地评价心肌梗死伴室壁瘤患者左心室容积及 EF。

[关键词] 实时三维超声心动图;心肌梗死;室壁瘤;超声心动图;左心室造影

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Real-time three dimensional echocardiography in evaluation of left ventricular volume and ejection fraction in patients with aneurysm combined with myocardial infarction

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[ABSTRACT] **Objective:** To assess the feasibility and accuracy of real-time three dimensional echocardiography (RT-3DE) in quantitative evaluation of left ventricular (LV) volume and ejection fraction (EF) in patients with ventricular aneurysm and myocardial infarction. **Methods:** Twenty-three patients with left ventricular aneurysm combined with myocardial infarction were examined by RT-3DE, two dimensional echocardiography Simpson's method, and M-mode Teichholz method separately. The following parameters; left ventricular end diastolic volume (LVEDV), end systolic volume (ESV), stroke volume (SV) and EF were obtained by each method and the results were compared with those obtained by left ventriculography (LVG). **Results:** The values of LVEDV, LVESV, SV, and EF determined by RT-3DE showed good correlations with those determined by LVG ($r=0.92, 0.90, 0.88, \text{ and } 0.91$, respectively; $P<0.001$), with the values by RT-3DE slightly smaller than those by LVG ($P>0.05$). The values of LVEDV, LVESV, SV, and EF determined by Simpson's method also showed good correlations with those determined by LVG ($r=0.85, 0.87, 0.86, 0.91$, respectively; $P<0.001$), with the values by Simpson's method smaller than those by LVG ($P<0.05$ for LVEDV and LVESV). The values of LVEDV, LVESV, SV, and EF determined by M-mode Teichholz method also showed good correlations with those determined by LVG ($r=0.73, 0.71, 0.70, 0.65$, respectively; $P<0.05$), with the values by M-mode Teichholz method larger than those by LVG ($P<0.05$ or $P<0.01$). **Conclusion:** RT-3DE is a more accurate for evaluation of LV volume and EF in patients with aneurysm combined with myocardial infarction. **[KEY WORDS]** real-time three dimensional echocardiography; myocardial infarction; heart aneurysm; echocardiography; left ventriculography

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左心室舒张末期容积(left ventricle end diastolic volume, LVEDV)、收缩末期容积(end systolic volume, LVESV)、每搏量(stroke volume, SV)及射血分数(ejection fraction, EF)等指标是判定心肌梗死患者临床预后、选择治疗方案的重要依据。心肌梗死特别是合并有室壁瘤的患者,由于左心室重构,

形态不规则,常规的超声心动图很难对其容量、功能做准确测量;研究表明实时三维超声心动图为容积式成像,不受检查对象形态、结构的限制,能更准确

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地评价左心室容量与功能^[1]。而左心室造影(left ventriculography, LVG)被认为是心脏容积及功能测定的参考标准^[2]。本研究以LVG为标准,探讨实时三维超声心动图(real time three-dimensional echocardiography, RT-3DE)定量评价左心室容积及射血分数的准确性及可靠性。

1 资料和方法

1.1 研究对象 23例心肌梗死合并室壁瘤患者(左心室造影和超声心动图确诊),男19例,女4例,年龄42~72岁,平均(58±8.9)岁。其中急性心梗9例,陈旧性心梗14例。室壁瘤部位:心尖部20例,下壁3例。

1.2 图像采集 RT-3DE和LVG图像采集时间间隔为2d内。同时检测心率和血压。

1.2.1 RT-3DE 采用 Philips Sonos 7500 型超声成像仪,探头频率2~4 MHz,配矩阵换能器,其实时三维显像方式主要有2种:实时三维(Live3D)显示方式和全容积(Full volume)成像方式。受检者平卧或左侧卧位,连接心电图,将探头置于心尖部,取心尖四腔观,嘱受检者平静呼吸,启动“Full volume”功能键获取全容积成像“金字塔”形数据库,并存储于光盘上。将光盘在德国 Tom Tec 公司推出的带有4D Cardio View RT 1.0分析测量软件的三维工作站上进行任意方位的切割旋转,直至在3个平面上分别同时显示左室心尖四腔观、两腔观和短轴观,取心内膜显示清晰的心尖四腔观和两腔观分别于舒张末期和收缩末期勾画内膜面(8平面法),计算机软件显示LVEDV(图1)和LVESV(图2),并由此计算出SV和EF。连续测量3次取平均值。

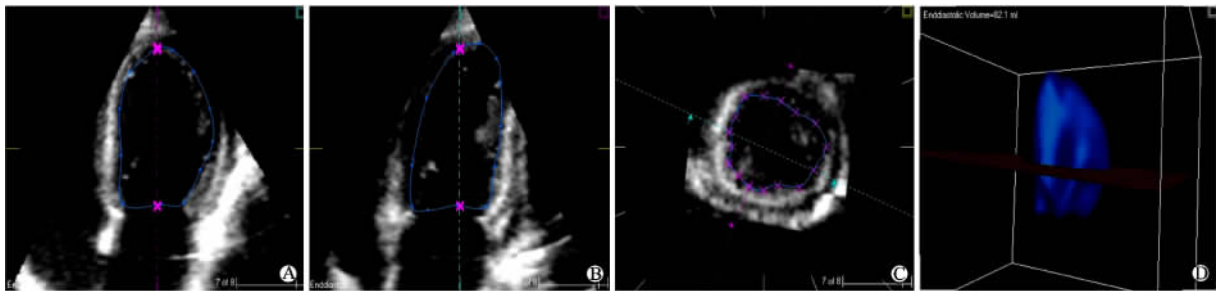


图1 勾画左心室舒张末期内膜面(8平面法)所得的LVEDV RT-3DE效果图

Fig 1 LVEDV examined by real-time 3DE was outlined and calculated with 8-plane method

A;Sagittal view;B:Coronal view;C:Short-axis view;D:LVEDV RT-3DE result

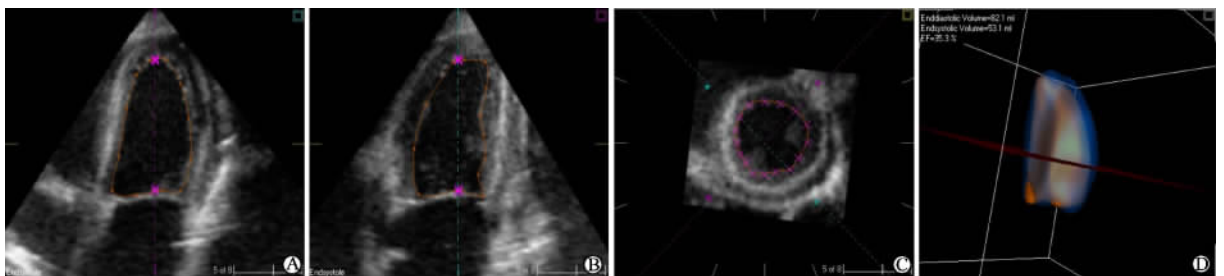


图2 勾画左心室舒张末期内膜面(8平面法)所得的LVESV RT-3DE效果图

Fig 2 LVESV examined by real-time 3DE was outlined and calculated with 8-plane method

A;Sagittal view;B:Coronal view;C:Short-axis view;D:LVESV RT-3DE result

1.2.2 常规超声检查 二维及M型超声心动图检查用SIMENS Acuson Aspen超声成像仪。每位受检者在三维图像采集完毕后,再摄取二维心尖四腔观和两腔观以及左心长轴观,采用双平面Simpson's法和Teichholz法分别测量LVEDV、LVESV、SV和EF值。连续测量3次取平均值。

1.2.3 LVG 将6F猪尾导管送至左心室流出道,连接高压注射器,以12~15 ml/s速度注射碘普胺30~50 ml,作右前斜位30°摄影。仪器使用 Philips

H5000(配有左心室功能定量分析软件)。于右前斜位30°以面积-长度法测定左心室容量和EF。

1.3 统计学处理 所有数据用 $\bar{x} \pm s$ 表示。两组数据之间的比较采用配对t检验,相关分析采用直线相关分析法。

2 结果

23例室壁瘤患者中21例获得了具有清晰内边界左心室RT-3DE,2例左心室部分缺失。常规

超声心动图均获得满意的图像。4种方法检查时心率、血压无差异。RT-3DE测量所得LVEDV、LVESV、SV、EF与LVG具有良好的相关性, r 分别为0.92、0.90、0.88、0.91(P 均 <0.001),LVEDV、LVESV、SV、EF测值均较LVG略小,但两者之间均无显著性差异(差值分别为 -4.2 ± 3.5 、 -2.4 ± 2.8 、 -1.5 ± 1.4 、 1.1 ± 1.1 , $P>0.05$)。二维超声心动图的双平面Simpson's法与LVG具有良好的相关性, r 分别为0.85、0.87、0.86、0.91(P 均 $<$

0.001),LVEDV、LVESV、SV、EF测值均较LVG略小,其中LVEDV、LVESV有显著差异(差值分别为 -8.1 ± 5.4 、 -6.3 ± 4.2 , $P<0.05$),SV、EF无差异(差值分别为 -1.7 ± 1.5 、 2.0 ± 1.7 , $P>0.05$);M型超声心动图Teichholz法与LVG具有一定的相关性, r 分别为0.73、0.71、0.70、0.65(P 均 <0.05),LVEDV、LVESV、SV、EF测值均较LVG大(差值分别为 14.6 ± 8.9 、 7.6 ± 5.5 、 10.0 ± 6.4 、 4.0 ± 2.9 , $P<0.05$ 或 $P<0.01$)。详见表1。

表1 超声心动图与左心室造影测量左室容量及射血分数比较

Tab 1 Comparison of left ventricular volume and ejection fraction measured by different methods

Method	n	LVEDV(V/ml)	LVESV(V/ml)	SV(V/ml)	EF(%)
RT-3DE	21	147.2 \pm 25.4	82.5 \pm 16.2	65.1 \pm 10.4	44.0 \pm 5.9
Simpson's	23	143.6 \pm 24.8*	78.1 \pm 15.7*	65.0 \pm 10.8	45.2 \pm 6.1
Teichholz	23	162.5 \pm 28.9**	87.3 \pm 17.1*	74.5 \pm 11.6*	46.0 \pm 6.8*
LVG	23	150.1 \pm 25.8	83.2 \pm 16.8	65.8 \pm 11.2	43.5 \pm 6.2

* $P<0.05$, ** $P<0.01$ vs LVG($\bar{x}\pm s$)

3 讨论

目前临床上超声心动图常用双平面Simpson's法和M型超声心动图Teichholz法来评价左心室容量和功能,但这些方法均是按照几何学上假设,根据公式计算出来的。对于节段性室壁运动异常,特别是合并室壁瘤时,由于心室形态发生改变,容易出现偏差。本研究中由于多数患者为心尖部室壁瘤,M型超声心动图Teichholz法测得的EDV、ESV、SV均较LVG结果高;双平面Simpson's法由于仅根据相互垂直的两个切面来推测左室容积,不能反映整个左室全貌,容易高估或低估。RT-3DE基于矩阵型探头成像技术,通过对左心室腔包含的体素量来定量左心室容积和EF^[1,3~6],不受左心室形态、结构的限制,因此所测得的结果更接近实际情况。近几年国内实验及国外临床研究证实RT-3DE是评价心室容积及EF的好方法,且较传统二维超声优越^[3~8]。本研究也在室壁瘤患者中验证了RT-3DE较常规的超声心动图能更准确测量左心室容量与EF。

目前RT-3DE尚存在一定的局限性:(1)二维图像质量较常规的超声心动图差;(2)“金字塔”容积的扇角为 $60^\circ\times 60^\circ$,对于心脏明显增大者可能出现心室部分容积的残缺。本研究中有2例患者出现心腔部分残缺。

总之,RT-3DE能准确评价左心室容积及EF,适宜于评价心肌梗死伴室壁瘤患者的左心功能,具

有较强的临床应用价值。

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