

doi: 10.13241/j.cnki.pmb.2018.15.032

超声心动图检查对慢性肺源性心脏病患者右心功能的诊断价值*

李 玲 吕小勇[△] 王文平 夏彩凤 相三婷

(南京医科大学附属江宁医院超声诊断科 江苏 南京 211100)

摘要 目的:探讨超声心动图检查对慢性肺源性心脏病患者右心功能的诊断价值。**方法:**选取 2016 年 8 月至 2017 年 12 月间本院收治的 35 例慢性肺源性心脏病患者作为实验组,并选择同期健康体检者 35 例作为对照组,全部受试者均给予超声心动图检查。分别比较两组右房横径(RA)、右室前后径(RV)、肺动脉平均压(MPAP)、射血分数(EF)、舒张晚期 A 波峰值流速与舒张早期 E 波峰值流速的比值(A/E)和右心室 Tei 指数。同时比较实验组采用常规 12 导联心电图检查及超声心动图检查的诊断阳性率、右心扩大阳性率和右心扩大伴心衰阳性率。**结果:**与对照组相比,实验组 RA、RV 以及 MPAP 均升高,组间比较差异有统计学意义($P<0.05$)。与对照组相比,实验组 EF 明显降低,而 A/E 值、Tei 指数明显升高,组间比较差异有统计学意义($P<0.05$)。实验组超声心动图检查的诊断阳性率、右心扩大阳性率和右心扩大伴心衰阳性率均高于常规 12 导联心电图检查($P<0.05$)。**结论:**应用超声心动图检查能够有效诊断慢性肺源性心脏病患者的右心功能,而且操作简单方便,诊断阳性率较高。

关键词:超声心动图;慢性肺源性心脏病;右心功能;诊断价值

中图分类号:R541.5 文献标识码:A 文章编号:1673-6273(2018)15-2946-04

Diagnostic Value of Echocardiography of Right Ventricular Function in Patients with Chronic Cor Pulmonale*

LI Ling, LV Xiao-yong[△], WANG Wen-ping, XIA Cai-feng, XIANG San-ting

(Department of Ultrasound Diagnosis, The Affiliated Jiangning Hospital of Nanjing Medical University, Nanjing, Jiangsu, 211100, China)

ABSTRACT Objective: To investigate the diagnostic value of echocardiography of right ventricular function in patients with chronic cor pulmonale. **Methods:** 35 patients with chronic cor pulmonale who were admitted in our hospital from August 2016 to December 2017 were enrolled as the experimental group, and 35 healthy physical examination in the same period were enrolled as the control group. All subjects were given echocardiographic examination. The right atrial transverse diameter (RA), right ventricular anteroposterior diameter (RV), pulmonary artery mean pressure (MPAP), ejection fraction (EF), late diastolic A wave peak velocity and the ratio of early diastolic E wave to peak flow velocity (A/E) and right ventricular Tei index were compared between the two groups respectively. At the same time, the positive rate of diagnosis, the positive rate of right heart enlargement and the positive rate of right heart enlargement with heart failure in the experimental group were compared with routine 12 lead electrocardiogram and echocardiography. **Results:** Compared with the control group, the RA, RV and MPAP in the experimental group were all higher, and there were significant differences between the groups ($P<0.05$). Compared with the control group, the EF in the experimental group was significantly lower, but the A/E value and the Tei index were significantly higher, and there were significant differences between the groups ($P<0.05$). The positive rate of diagnosis, the positive rate of right heart enlargement and the positive rate of right heart enlargement with heart failure in the experimental group were higher than those of the routine 12 lead electrocardiogram examination ($P<0.05$). **Conclusion:** Echocardiography can accurately diagnose the right ventricular function of patients with chronic cor pulmonale, moreover, the operation is simple and convenient, and the positive rate of diagnosis is higher.

Key words: Echocardiography; Chronic cor pulmonale; Right ventricular function; Diagnostic value

Chinese Library Classification(CLC): R541.5 **Document code:** A

Article ID: 1673-6273(2018)15-2946-04

前言

慢性肺源性心脏病是指因支气管-肺组织、胸廓疾病或者肺血管病变而导致肺血管阻力上升,进一步引起右心室负荷、肺动脉压增加,从而改变右心室结构,致使右心衰的一种疾病,

临床中也将慢性肺源性心脏病简称为肺心病^[1-3]。慢性肺源性心脏病患者常常因为病情反复加剧而发生呼吸困难、胸闷等症状,进而逐渐加重心功能和肺功能损害,而且病死率较高^[4,5]。因此对慢性肺源性心脏病患者的心功能进行及时评价,并给予科学的、合理的干预治疗,这对于延缓慢性肺源性心脏病患者的

* 基金项目:江苏省卫生厅科研基金项目(YG2014237)

作者简介:李玲(1979-),女,本科,主治医师,从事产科超声、心脏、血管超声方面的研究, E-mail: vhmib@163.com

[△] 通讯作者:吕小勇(1973-),男,本科,副主任医师,从事心脏、血管超声、超声介入方面的研究, E-mail: tyggfj@163.com

(收稿日期:2018-03-28 接受日期:2018-04-23)

肺功能恶化非常重要^[67]。在对心脏功能和结构评价中,超声心动图检查是临床中最常用和最有效的方式之一,该检查方法操作简单方便,而且无创,能够较好地辅助肺动脉高压的筛查、了解肺动脉高压的原因和评估肺动脉高压的程度,以及对疾病进行危险分层,指导后续治疗方案的制定,且肺动脉高压的程度在临床上常被用于评价多种肺心病的病情及预后^[8-10]。本研究主要分析了超声心动图检查对慢性肺源性心脏病患者右心功能的诊断价值,以期对慢性肺源性心脏病患者的临床诊断提供科学依据,现作如下汇报。

1 资料与方法

1.1 一般资料

将 2016 年 8 月至 2017 年 12 月间本院收治的慢性肺源性心脏病患者 35 例纳入本研究,作为实验组,纳入标准:(1)均符合我国第三次肺心病专业学会制定的有关肺源性心脏病的相关诊断标准^[11];(2)患者或家属知情同意并签署知情同意书;(3)积极配合者。排除标准:(1)合并先天性心脏病、风湿性心脏病、冠心病、心肌病、心肌炎等其他类型心脏病的患者;(2)合并甲状腺功能疾病、糖尿病以及高血压等疾病的患者;(3)精神失常者。其中男性 21 例,女性 14 例;年龄 46-77 岁,平均(60.74±5.26)岁;病程 4 个月-10 年,平均(4.13±2.28)年。选择本院同期健康体检者 35 例作为对照组,男性 20 例,女性 15 例;年龄 44-73 岁,平均(60.15±5.19)岁。两组受试者在性别、年龄方面比较无统计学差异($P>0.05$),提示组间可比。本研究经医院伦理委员会批准。

1.2 方法

全部受试者均给予超声心动图检查。选择荷兰 Philips IE33 型彩色多普勒超声诊断仪,协助患者选择仰卧位,探头频率为 2-5MHz,对心电图进行同步记录,将其作为确定心脏舒张期和收缩期的标志。首先对研究对象实施常规心脏检查,对右心室、右心房、肺动脉舒张末期和收缩期的血流速度进行测量。选择右心室流出道长轴切面和心尖四腔心切面对射血分数(ejection fractions, EF)进行测量,在右心室游离壁三尖瓣环附着点处放

置取样容积,血流夹角应保持为 20°,多普勒取样线应该尽量平行于右心室长轴房室环运动,对肺动脉平均压(mean pulmonary arterial pressure, MPAP)、右房横径(right atrium, RA)、右室前后径(right ventricular, RV)进行测定。对肺动脉瓣的血流速度时间进行测量,并做好记录,同时获得血流频谱。对三尖瓣射血间隔时间的 A 峰到下一心动周期的 E 峰起始时间进行记录,并对肺动脉射血时间的频谱和血流速度进行记录,对心动周期进行 3 次连续测量,取其平均值,并计算舒张晚期 A 波峰值流速与舒张早期 E 波峰值流速的比值(A/E)和右心室 Tei 指数。Tei 指数的具体定义为:a 是指单个心动周期内的三尖瓣口血流 A 波结束后到下一心动周期 T 波开始的周期;在右心室流出道切面对收缩期的肺动脉瓣口血流频谱进行记录;b 是指单个心动周期内收缩期的肺动脉血流起始处到右心室的射血时间。a-b 是指心室等容收缩时间和等容舒张时间相加,(a-b)/b 也就是右心室 Tei,在出现右心室功能不全时,Tei 指数则增加^[12]。此外,实验组另给予常规 12 导联心电图检查,获取两种检查方式的诊断阳性率、右心扩大阳性率和右心扩大伴心衰阳性率。

1.3 观察指标

比较两组受试者的 RA、RV、MPAP、EF、A/E 值和 Tei 指数,同时比较实验组采用常规 12 导联心电图检查及超声心动图检查的诊断阳性率、右心扩大阳性率和右心扩大伴心衰阳性率。

1.4 统计学方法

本次实验数据采用 SPSS21.0 软件进行统计学分析,其中 RA、RV、A/E 值、Tei 指数等计量资料以($\bar{x} \pm s$)表示,对比采用 t 检验,诊断阳性率、右心扩大阳性率和右心扩大伴心衰阳性率等计数资料以(%)表示,对比采用 χ^2 检验,检验水准设置为 $\alpha=0.05$ 。

2 结果

2.1 两组超声心动图指标比较

与对照组相比,实验组 RA、RV 以及 MPAP 均升高,组间比较差异有统计学意义($P<0.05$)。见表 1。

表 1 两组超声心动图指标比较($\bar{x} \pm s$)

Table 1 Comparison of echocardiographic indexes between the two groups($\bar{x} \pm s$)

Groups	n	RA(cm)	RV(cm)	MPAP(mmHg)
Control group	35	3.51±0.31	1.83±0.18	20.29±3.13
Experimental group	35	5.37±0.68	3.82±0.33	31.44±4.52
t	-	14.724	31.320	11.998
P	-	0.000	0.000	0.000

2.2 两组 EF、A/E 值、Tei 指数比较

与对照组相比,实验组 EF 明显降低,而 A/E 值、Tei 指数

明显升高,组间比较差异有统计学意义($P<0.05$)。见表 2。

表 2 两组 EF、A/E 值、Tei 指数比较($\bar{x} \pm s$)

Table 2 Comparison of EF, A/E value and Tei index between the two groups($\bar{x} \pm s$)

Groups	n	EF(%)	A/E value	Tei index
Control group	35	0.66±0.12	0.92±0.24	0.33±0.07
Experimental group	35	0.51±0.07	1.44±0.36	0.71±0.13
t	-	6.388	7.110	15.226
P	-	0.000	0.000	0.000

2.3 实验组不同检查方式阳性率比较

超声心动图检查的诊断阳性率、右心扩大阳性率和右心扩

大伴心衰阳性率均高于常规 12 导联心电图检查 ($P < 0.05$)。见

表 3。

表 3 实验组不同检查方式阳性率比较[n(%)]

Table 3 Comparison of positive rate of different examination methods in experimental group[n(%)]

Examination methods	n	Positive rate of diagnosis	Positive rate of right heart enlargement	Positive rate of right heart enlargement with heart failure
Routine 12 lead electrocardiogram examination	35	21(60.00)	16(45.71)	12(34.29)
Echocardiographic examination	35	32(91.43)	31(88.57)	22(62.86)
χ^2		9.401	14.570	5.719
P		0.002	0.000	0.017

3 讨论

对于慢性肺源性心脏病患者来讲,发病比较缓慢,病程较长,其反复出现的水肿和气道炎症可能增加肺循环的压力和阻力,进而增加右心室的压力负荷,引起右心功能损害和右心室肥厚增大,病情严重则可能导致右心衰和肺动脉高压^[13-15]。临床中为延缓右心功能恶化,应及时发现慢性肺源性心脏病发病早期右心室功能和结构的异常变化,并给予有针对性地干预治疗^[16]。临床研究结果证实,在对右心室功能和结构进行检查时,常规心脏超声检查无法有效满足临床实际需求^[17,18],而现阶段超声心动图检查是最常用和最有效诊断右心室功能的方式,其优点主要为操作简单方便,检查价格经济,而且无创,能在基层医院推广和应用,可重复性比较好,心脏形状、血压以及心率等因素不会对检查结果造成影响,具有较高的准确性^[19,20]。随着超声心动图技术的迅速发展和不断完善,新指标在临床诊断中的应用也越来越广泛,如 Tei 指数^[21]。过往临床中常常用 Tei 指数来判断左心功能,在现代医学技术快速发展的过程中,Tei 指数也开始被应用于诊断右心功能^[22]。临床研究结果证实,Tei 指数是判断心衰患者预后的独立指标,而且三尖瓣返流、右心室压力、心率以及年龄等不会对 Tei 指数造成影响^[23,24]。此外,有研究报道,慢性肺源性心脏病患者的 Tei 指数与肺动脉压力、病死率密切相关^[25]。

本研究结果发现,在 RA、RV、MPAP、A/E 值、Tei 指数方面,实验组均显著高于对照组,在 EF 方面,实验组显著低于对照组,说明慢性肺源性心脏病患者上述指标均有异常,Tei 指数是超声心动图检查的综合结果体现,Tei 指数异常则表明长时间的慢性肺源性心脏病史导致了患者右心功能出现改变,能为临床诊断提供科学依据,进而使临床漏诊率和误诊率降低。对于慢性肺源性心脏病患者,因为肺功能障碍而引起肺小动脉痉挛,增加肺动脉压,主肺动脉和右室流出道表现为代偿性增宽,如果患者病情严重则可能出现肺动脉瓣狭窄或者关闭不全^[26,27]。长时间的肺动脉高压会加重患者的右室阻力复合,增加了室间隔和右心室壁厚度,从而导致右室扩大。当三尖瓣 E 峰流速降低,三尖瓣 A 峰流速升高时,右室舒张功能也会降低。同时本研究对不同检查方式进行了比较,结果发现与常规 12 导联心电图检查比较,超声心动图检查的诊断阳性率、右心扩大阳性率和右心扩大伴心衰阳性率均明显更高,提示采用超声心动图对慢性肺源性心脏病进行检查,获得的结果更为准确。与

常规心电图检查相比,超声心动图可对重要的区域进行连续且更为细致的观察,收集更为有效的信息,进一步为临床正确诊断提供更为有力的依据^[28]。采用超声心动图对慢性肺源性心脏病患者进行检查时,可见主肺动脉收缩期的血流加速时间和射血时间缩短、峰速低,肺血管阻力较大,血流频谱呈典型的三角形,同时患者右心房及右心室流出道内均可观察到五彩色的三尖瓣反流束,而肺动脉的血流则呈现出较为暗淡的颜色^[29,30]。这些较为直观的超声心动图表现,也为慢性肺源性心脏病的诊断提供了较为可靠的依据。

综上所述,应用超声心动图检查可对慢性肺源性心脏病患者的右心功能进行有效诊断,而且操作简单方便,在基层医院中也可推广应用,有利于降低漏诊率和误诊率。

参考文献 (References)

- [1] 李生浩,徐肇元,周宇航,等.肺源性心脏病患者血清 sST2、NT-proBNP、超声心动图参数的变化特征及相互关系[J].临床肺科杂志,2017, 22 (1): 77-81
- [2] Li Sheng-hao, Xu Zhao-yuan, Zhou Yu-hang, et al. Characteristics and correlation of serum sST2, NT-proBNP and echocardiography parameters in patients with pulmonary heart disease [J]. Journal of Clinical Pulmonary Medicine, 2017, 22(1): 77-81
- [3] Barak OF, Mladinov S, Hoiland RL, et al. Disturbed blood flow worsens endothelial dysfunction in moderate-severe chronic obstructive pulmonary disease[J]. Sci Rep, 2017, 7(1): 16929
- [4] Beauchamp MK, Brooks D, Ellerton C, et al. Pulmonary Rehabilitation With Balance Training for Fall Reduction in Chronic Obstructive Pulmonary Disease: Protocol for a Randomized Controlled Trial[J]. JMIR Res Protoc, 2017, 6(11): e228
- [5] 赵虎雷,谢洋,李建生,等.慢性阻塞性肺疾病合并心血管疾病的常用评价指标[J].中国中西医结合急救杂志, 2015, 22(5): 550-553
- [6] Zhao Hu-lei, Xie Yang, Li Jian-sheng, et al. Common evaluation indexes of chronic obstructive pulmonary disease with cardiovascular disease [J]. Chinese Journal of Integrated Traditional and Western Medicine in Intensive and Critical Care, 2015, 22(5): 550-553
- [7] Eapen MS, Hansbro PM, McAlinden K, et al. Abnormal M1/M2 macrophage phenotype profiles in the small airway wall and lumen in smokers and chronic obstructive pulmonary disease (COPD)[J]. Sci Rep, 2017, 7(1): 13392
- [8] 杨继雷,姚秀叶,谷伟,等.参麦注射液联合左卡尼汀对慢性肺源性心脏病心功能的影响 [J]. 中国临床药理学杂志, 2016, 32(5):

- 396-398, 405
- Yang Ji-lei, Yao Xiu-ye, Gu Wei, et al. Influences on cardio -pulmonary function for chronic pulmonary heart disease treated by levocarnitine combined with Shenmai injection[J]. The Chinese Journal of Clinical Pharmacology, 2016, 32(5): 396-398, 405
- [7] Bornheimer R, Shea KM, Sato R, et al. Risk of exacerbation following pneumonia in adults with heart failure or chronic obstructive pulmonary disease[J]. PLoS One, 2017, 12(10): e0184877
- [8] Liu Y, Wang D, Du Q, et al. Evaluation of Right Ventricular Systolic Function in Patients With Chronic Pulmonary Heart Disease by 2-Dimensional Speckle-Tracking Echocardiography[J]. J Ultrasound Med, 2016, 35(11): 2333-2342
- [9] Chamsi-Pasha MA, Sengupta PP, Zoghbi WA. Handheld Echocardiography: Current State and Future Perspectives [J]. Circulation, 2017, 136(22): 2178-2188
- [10] Yang L, Wang J, Wang Y, et al. Results of performing or not cardiac resynchronization therapy for live assessment of LV function and mechanical systole synchrony using gated myocardial perfusion imaging and real-time three-dimensional echocardiography. Seven months follow-up[J]. Hell J Nucl Med, 2017, 20(3): 247-250
- [11] 蒋红红,唐永秀.慢性肺源性心脏病阴虚证与血瘀关系分析[J].吉林中医药, 2010, 30(2): 137, 171
- Jiang Hong-hong, Tang Yong-xiu. Analysis of Relationship between Deficiency of Yin Syndrome and Blood Stasis in Chronic Pulmonary Heart Disease[J]. Jilin Journal of Traditional Chinese Medicine, 2010, 30(2): 137, 171
- [12] 李霞.Tei 指数对老年慢性肺源性心脏病患者右心功能的评价[J].重庆医学, 2013, 42(24): 2842-2843, 2846
- Li Xia. Evaluation on Tei index for right heart function of elderly patients with chronic cor pulmonale [J]. Chongqing Medicine, 2013, 42(24): 2842-2843, 2846
- [13] Grosse A, Grosse C, Lang IM. Distinguishing Chronic Thromboembolic Pulmonary Hypertension From Other Causes of Pulmonary Hypertension Using CT [J]. AJR Am J Roentgenol, 2017, 209(6): 1228-1238
- [14] Hibi A, Kumano Y. Sphingobacterium spiritivorum bacteremia due to cellulitis in an elderly man with chronic obstructive pulmonary disease and congestive heart failure:a case report [J]. J Med Case Rep, 2017, 11(1): 277
- [15] Yoo KH, Chung WY, Park JH, et al. Short-term Evaluation of a Comprehensive Education Program Including Inhaler Training and Disease Management on Chronic Obstructive Pulmonary Disease[J]. Tuberc Respir Dis (Seoul), 2017, 80(4): 377-384
- [16] Liu HJ, Guo J, Zhao QH, et al. Chronotropic Incompetence and its Relation to Exercise Intolerance in Chronic Obstructive Pulmonary Disease[J]. Am J Med Sci, 2017, 353(3): 216-223
- [17] Havasi K, Domsik P, Kalapos A, et al. Left Atrial Deformation Analysis in Patients with Corrected Tetralogy of Fallot by 3D Speckle-Tracking Echocardiography (from the MAGYAR-Path Study)[J]. Arq Bras Cardiol, 2017, 108(2): 129-134
- [18] Ryan TD, Madueme PC, Jefferies JL, et al. Utility of Echocardiography in the Assessment of Left Ventricular Diastolic Function and Restrictive Physiology in Children and Young Adults with Restrictive Cardiomyopathy: A Comparative Echocardiography-Catheterization Study[J]. Pediatr Cardiol, 2017, 38(2): 381-389
- [19] 尚晓娜,刘学梅,朱香妮,等.经胸壁超声心动图在先天性心脏病患者左心室功能评价中的应用价值[J].现代生物医学进展, 2017, 17(35): 6938-6941
- Shang Xiao-na, Liu Xue-mei, Zhu Xiang-ni, et al. The value of transthoracic echocardiography in evaluation of left ventricular function in patients with congenital heart disease [J]. Progress in Modern Biomedicine, 2017, 17(35): 6938-6941
- [20] Yeh HM, Lin TT, Yeh CF, et al. Biomarkers and echocardiography for evaluating the improvement of the ventricular diastolic function after surgical relief of hydronephrosis [J]. PLoS One, 2017, 12(11): e0188597
- [21] Sicari R, Cortigiani L. The clinical use of stress echocardiography in ischemic heart disease[J]. Cardiovasc Ultrasound, 2017, 15(1): 7
- [22] Tissera G, Piskorz D, Citta L, et al. Morphologic and Functional Heart Abnormalities Associated to High Modified Tei Index in Hypertensive Patients [J]. High Blood Press Cardiovasc Prev, 2016, 23(4): 373-380
- [23] Tissera G, Piskorz D, Citta L, et al. Morphologic and Functional Heart Abnormalities Associated to High Modified Tei Index in Hypertensive Patients [J]. High Blood Press Cardiovasc Prev, 2016, 23(4): 373-380
- [24] Bokiniec R, Własienko P, Borszewska-Kornacka MK, et al. Myocardial performance index (Tei index) in term and preterm neonates during the neonatal period[J]. Kardiologia, 2016, 74(9): 1002-1009
- [25] 龚璐璐.无创呼吸机对老年慢性肺源性心脏病患者的影响分析[J].实用心脑血管病杂志, 2016, (1): 115-117
- Gong Lu-lu. Impact of Non -invasive Ventilator on Elderly Patients with Pulmonary Heart Disease [J]. Practical Journal of Cardiac Cerebral Pneumal and Vascular Disease, 2016, (1): 115-117
- [26] Goroshi M, Chand D. Myocardial Performance Index (Tei Index): A simple tool to identify cardiac dysfunction in patients with diabetes mellitus[J]. Indian Heart J, 2016, 68(1): 83-87
- [27] Sivanandam S, Wey A, St Louis J. Intraoperative transesophageal echocardiographic assessment of left ventricular Tei index in congenital heart disease[J]. Ann Card Anaesth, 2015, 18(2): 198-201
- [28] Laufer-Perl M, Gura Y, Shimiaie J, et al. Mechanisms of Effort Intolerance in Patients with Rheumatic Mitral Stenosis: Combined Echocardiography and Cardiopulmonary Stress Protocol[J]. JACC Cardiovasc Imaging, 2017, 10(6): 622-633
- [29] 蒋春兰,朱林平,吴棘,等.尘肺病患者超声心动图肺循环血流动力学指标分析[J].中国职业医学, 2016, 43(3): 285-288
- Jiang Chun-lan, Zhu Lin-ping, Wu Ji, et al. Analysis on pulmonary hemodynamic parameters in pneumoconiosis patients by echocardiography[J]. Chinese Occupational Medicine, 2016, 43(3): 285-288
- [30] Bulur S, Hsiung MC, Nanda NC, et al. Incremental value of live/real time three-dimensional transthoracic echocardiography over the two-dimensional technique in assessing carcinoid heart disease involving the aortic valve[J]. Echocardiography, 2016, 33(11): 1741-1744