

- Function and Checkpoint Inhibitor Pneumonitis in NSCLC [J]. JTO Clin Res Rep, 2021, 2 (10): 100220.
- [20] Tiu B C, Zubiri L, Iheke J, et al. Real-world incidence and impact of pneumonitis in patients with lung cancer treated with immune checkpoint inhibitors: a multi-institutional cohort study [J]. J Immunother Cancer, 2022, 10 (6): e004670.
- [21] Zhang Q, Tang L, Zhou Y, et al. Immune Checkpoint Inhibitor-Associated Pneumonitis in Non-Small Cell Lung Cancer: Current Understanding in Characteristics, Diagnosis, and Management [J]. Front Immunol, 2021, 12: 663986.
- [22] Sul J, Blumenthal G M, Jiang X P, et al. FDA Approval Summary: pembrolizumab for the treatment of patients with metastatic non-small cell lung cancer whose tumors express programmed death ligand 1 [J]. Oncologist, 2016, 21 (5): 643-650.

• 临床研究 •

右室心肌纵向应变评价二尖瓣狭窄患者右室收缩功能的临床研究

福建省泉州市第一医院心脏彩超室 (泉州 362000) 刘建平 周阿佩 邱金梅 洪丹丹 许洋洋 王清木

【摘要】 目的 应用二维斑点追踪成像技术评价二尖瓣狭窄患者右室心肌纵向应变, 探讨该技术在评价此类患者右室收缩功能中的临床应用价值。**方法** 随机选取我院收治的风湿性心脏病单纯二尖瓣狭窄患者 55 例, 经胸超声心动图测量二尖瓣瓣口面积 (MVA) 及右室收缩功能指标, 包含三尖瓣环收缩期峰值速度 (S')、三尖瓣环收缩期位移 (TAPSE)、右室做功指数 (RIME) 及右室面积变化分数 (FAC), 根据三尖瓣反流法估测肺动脉收缩压 (PASP); 二维斑点追踪成像 (2D-STI) 测量右室游离壁纵向收缩期峰值应变 ($RVLS_{FW}$), 并根据 $RVLS_{FW}$ 值将患者分为两组, $RVLS_{FW} < -19\%$ 为 A 组, $RVLS_{FW} \geq -19\%$ 为 B 组。**结果** 两组患者 MVA、PASP、TAPSE、 S' 、RIMP、FAC 及 $RVLS_{FW}$ 差异有统计学意义 ($P < 0.05$), 其中 $RVLS_{FW} \geq -19\%$ 的二尖瓣狭窄患者右室收缩功能减低更为明显 ($P < 0.05$); $RVLS_{FW}$ 与 PASP、RIMP 呈正相关关系 (r 值分别为 0.521、0.511, P 值均 < 0.05), 与 MVA、TAPSE、FAC、 S' 呈负相关关系 (r 值分别为 -0.521、-0.410、-0.435、-0.385, P 值均 < 0.05)。**结论** 右室心肌纵向应变能够评价二尖瓣狭窄患者右室收缩功能, 为临床提供更多可靠信息。

【关键词】 斑点追踪显像; 右室收缩功能; 二尖瓣狭窄

【中图分类号】 R445.1; R542.5⁺1 **【文献标识码】** B **【文章编号】** 1002-2600(2022)06-0031-04

Clinical study on right ventricular longitudinal strain for evaluating right ventricular function in mitral stenosis

LIU Jianping, ZHOU Apei, QIU Jinmei, HONG Dandan, XU Yangyang, WANG Qingmu. Department of Echocardiography, Quanzhou First Hospital, Quanzhou, Fujian 362000, China

【Abstract】 Objective To measure right ventricular longitudinal strain in patients with mitral stenosis (MS) by 2D speckle tracking imaging (2D-STI), and explore the clinical value of this technique in evaluating right ventricular systolic function in these patients. **Methods** Fifty-five patients with rheumatic mitral stenosis who were treated in our hospital were randomly selected. The mitral valve orifice area (MVA) and right ventricular systolic function index including tricuspid lateral annular systolic velocity (S'), tricuspid annular plane systolic excursion (TAPSE), RV index of myocardial performance (RIME) and right ventricular fractional area change (FAC) were measured by transthoracic echocardiography (TTE), and the pulmonary systolic pressure (PASP) was estimated by the tricuspid regurgitation method; 2D speckle tracking imaging (2D-STI) was used to measure the free-wall right ventricular longitudinal strain ($RVLS_{FW}$), and the patients were divided into two groups according to the $RVLS_{FW}$ value: group A with $RVLS_{FW} < -19\%$, and group B with $RVLS_{FW} \geq -19\%$. **Results** There were significant differences in MVA, PASP, TAPSE, S' , RIMP, FAC and $RVLS_{FW}$ between the two groups ($P < 0.05$), and the right ventricular systolic function decreased more significantly in patients with $RVLS_{FW} \geq -19\%$ mitral stenosis ($P < 0.05$); $RVLS_{FW}$ was positively correlated with PASP and RIMP ($r = 0.521, 0.511, P < 0.05$), and negatively correlated with MVA, TAPSE, FAC and S' ($r = -0.521, -0.410, -0.435, -0.385, P < 0.05$). **Conclusion** Right ventricular longitudinal strain can evaluate right ventricular systolic function in patients with mitral stenosis, and provide more reliable information for

clinical practice.

【Key words】 speckle tracking imaging; right ventricular systolic function; mitral stenosis

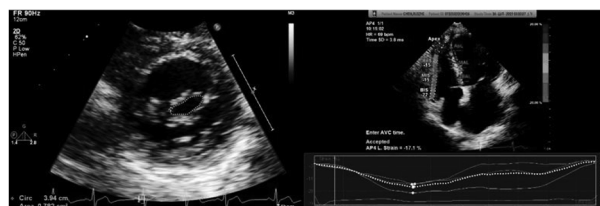
有研究显示,风湿性心脏病中二尖瓣狭窄(mitral stenosis, MS)的发病率最高,约为 65%~100%^[1]。MS 不仅引起患者左室充盈减少,还可因肺静脉回流障碍导致肺动脉高压、右室收缩功能减低,影响预后。因此,评价右室收缩功能是超声诊断 MS 的重要内容。斑点追踪成像(speckle tracking imaging, STI)技术具有无角度依赖性的优势,通过识别组织斑点信号测量收缩期峰值长轴心肌应变(strain, S)及应变率(strainrate, SR)。国内外多项研究证实该技术可用于右室收缩功能的评价。本研究采用 2D-STI 技术定量评价风湿性心脏病单纯 MS 患者的右室收缩功能,分析其与二尖瓣瓣口面积、肺动脉高压及超声心动图右室收缩功能指标的相关性,探讨该技术在评价 MS 右室收缩功能中的临床应用价值。

1 资料与方法

1.1 研究对象: 随机选取我院 2018 至 2021 年门诊及住院的风湿性心脏病单纯 MS 患者 55 例,其中男性 15 例,女性 40 例,年龄 40~61 岁。纳入标准:1) 窦性心律、心率 60~100 次/min;2) 二维图像清晰、二尖瓣瓣口面积(mitral valve orifice area, MVA)小于 2.0 cm²、各心瓣膜反流均不超过中量、左室射血分数在 50%以上;3) 患者及家属知情并签署知情同意书。排除标准:1) 三尖瓣无反流或反流量少,无法获取完整的反流频谱者;2) 患有冠心病、心肌病、高血压性心脏病及先天性心脏病等导致心功能受损的心脏疾病;3) 胸廓畸形、肺部疾病、系统性疾病等导致肺动脉高压的疾病;4) 患者拒绝本研究或因其他原因终止本研究。

1.2 仪器与方法: 受检者左侧卧位,采用 PHILIPS EPIQ7C、EPIQ5、IE Elite 型彩色多普勒超声诊断仪、S5-1 探头,连接心电图。如图 1 所示,在放大的二尖瓣短轴切面,舒张末期描记二尖瓣口最小面积(MVA);根据三尖瓣反流法估测肺动脉收缩压(PASP)^[2];参照 2020 年英国超声心动图协会(BSE)成人右心超声心动图评估指南^[3]:以右室为中心取心尖四腔心切面,M 型超声测量三尖瓣侧壁瓣环收缩期位移(TAPSE),右室

舒张末期面积(RVEDA)和右室收缩末期面积(RVESA)计算右室面积变化分数(FAC);在 TDI 的条件下测量三尖瓣侧壁瓣环的收缩期速度(S)。参照 2018 EACVI/ASE 左心房、右心室和右心房变形的标准化二维斑点追踪超声心动图检查共识^[4],以右室为中心,呼气末采集心尖四腔心二维动态图像,帧频>60 fps,清晰显示右室游离壁及室间隔,存储动态 DICOM 图像并待脱机分析,将图像导入 Qlab10.5 工作站进行分析,得出右室游离壁纵向应变(图 1)。亦根据上述共识,RVLS_{FW}以-19%为临界值,将受检者分为两组,RVLS_{FW}<-19%为 A 组,RVLS_{FW}≥-19%为 B 组。



注:该病例 MVA=0.78 cm²、RVLS_{FW}=-17.1%。

图 1 二维描记法测量 MVA、斑点追踪测量 RVLS_{FW}示意图

1.3 统计学方法: 采用 SPSS 20.0 软件进行统计处理分析。计量资料经正态性及方差齐性检验,采用均数±标准差表示,其组间比较行 *t* 检验,多组间比较及组内比较采用单因素方差分析;相关性分析采用 Pearson 检验。以 *P*<0.05 为差异有统计学意义。

2 结果

2.1 两组基线资料比较: A 组 21 例,男性 5 例,女性 16 例,平均年龄(49.5±9.4)岁,左室射血分数(LVEF)(63.5±5.7)%;B 组 34 例,男性 10 例,女性 24 例,平均年龄(51.2±10.3)岁,LVEF(65.1±4.3)%;上述基本资料两组患者间差异无统计学意义(*P*>0.05)。

2.2 两组各超声参数比较: 如表 1 所示,两组患者 MVA、PASP、右室收缩功能参数及 RVLS_{FW}比较具有统计学意义(*P*<0.05),其中 B 组右室收缩功能减低更为明显(*P*<0.05)。

表 1 两组患者 MVA、PASP、右室收缩功能参数及 RVLS_{FW} 比较 ($\bar{x} \pm s$)

组别	例数	MVA/cm ²	PASP/mm Hg	TAPSE/mm	S'/(cm/s)	RIMP	FAC(%)	RVLS _{FW} (%)
A 组	21	1.54±0.33	38.5±7.3	18.32±2.77	12.16±2.11	0.46±0.21	37.01±3.25	-23.95±2.86
B 组	34	0.92±0.21	51.6±6.9	12.51±4.67	8.91±2.64	0.71±0.35	31.72±4.13	-16.34±2.48
<i>t</i> 值		5.523	5.042	4.934	6.711	7.307	4.755	6.971
<i>P</i> 值		0.001	0.011	0.001	0.000	0.000	0.003	0.000

注: 1 mm Hg=0.133 kPa。

2.3 相关性分析: RVLS_{FW} 与 PASP、RIMP 呈正相关关系 (r 值分别为 0.521、0.511, P 值均 < 0.05), 与 MVA、TAPSE、FAC、S' 呈负相关关系 (r 值分别为 -0.521、-0.410、-0.435、-0.385, P 值均 < 0.05)。

3 讨论

右室收缩功能对后负荷的变化敏感, 后负荷还是正常右室功能的主要决定因素, 右室射血分数 (RVEF) 与肺动脉压力成反比^[5], 当肺动脉收缩压急剧升高时, 右室搏出量显著降低。MS 患者左心室前负荷及泵血减少, 同时, 左心房压力升高, 右室后负荷升高。这会造成多种不利影响, 在肺动脉层面, 会导致肺动脉顺应性下降, 并通过急性血管收缩和慢性血管重构增加肺动脉血管阻力, 逐渐进展为不可逆的肺动脉高压^[6]。对右室而言, 升高的后负荷叠加于右室, 首先可促进代偿性心肌细胞肥大和纤维化, 类似于左心衰时发生的重构, 如果负荷持续存在, 那么右室从代偿表型转向失代偿表型, 后者以心肌细胞丢失和替换性纤维化为特征^[7]。在这个过程中, 右室收缩功能呈进行性下降。同时, 右室充盈压升高, 冠状静脉窦回流受阻, 从而减少冠状动脉血流, 并可能诱发心肌缺血^[8]。另外, 右室充盈压的增高还可引起室间隔左移, 改变左室的几何形状, 降低左室的膨胀性、前负荷和心室弹性, 对左室舒张期充盈造成不利影响, 进一步加重左心室前负荷及泵血减少^[9]。以上变化最终导致全心衰竭, 严重影响预后。因此, 右室收缩功能评价对 MS 患者的病程进展及预后判断尤为重要。

由于右室复杂的几何形态, 二维超声心动图 (UCG) 难以通过几何假设模型评估其射血分数。最新指南^[3]推荐的右室收缩功能评价指标包含 TAPSE、FAC、RIMP、S', 经组织多普勒测量的 S' 和 RIMP 具有角度依赖性, 故经二维 UCG 定量测量右室收缩功能存在局限性^[10]。2D-STI 无角度依赖性, 通过识别组织斑点信号, 能很好地区分心肌组织的主动收缩、舒张运动和被动牵拉运动, 是

评价右室功能的新方法^[11]。多项研究表明, 右室应变成像有助于识别预后不佳的肺动脉高压患者^[12-13]。

本研究显示: RVLS_{FW} $\geq -19\%$ 病例组, 其右室收缩功能减低更明显, 且 RVLS_{FW} 与右室收缩功能指标 TAPSE、FAC、RIMP、S' 具有相关性, 与既往研究相符^[14], 这表明 RVLS_{FW} 能够评价右室收缩功能; RVLS_{FW} 与 MVA、PASP 具有相关性, 即 RVLS_{FW} 越大的患者, 其 MVA 更小、PASP 更高, 这提示在单纯 MS 患者中, RVLS_{FW} 或许能够反映二尖瓣狭窄的程度及病情进展。

综上所述, 右室心肌纵向应变能够评价 MS 患者的右室收缩功能, 有助于识别预后不佳的 MS 患者, 为临床提供更多可靠信息。

参考文献

- [1] Sattarzadeh R, Tavoosi A, Saadat M, et al. Calculation of mitral valve area in mitral stenosis: comparison of continuity equation and pressure half time with two-dimensional planimetry in patients with and without associated aortic or mitral regurgitation or atrial fibrillation [J]. Acta Med Iran, 2017, 55 (11): 696-704.
- [2] 孙丹丹, 侯颖. 应用三尖瓣血流速度图评估肺动脉高压的研究 [J]. 中国医学影像学杂志, 2017, 25 (1): 13-16.
- [3] Zaidi A, Knight D S, Augustine D X, et al. Echocardiographic assessment of the right heart in adults: a practical guideline from the British Society of Echocardiography [J]. Echo Research and Practice, 2020, 7 (1): G19-G41.
- [4] Badano L P, Kolas T J, Muraru D, et al. Standardization of left atrial, right ventricular, and right atrial deformation imaging using two-dimensional speckle tracking echocardiography: a consensus document of the EACVI/ASE/Industry Task Force to standardize deformation imaging [J]. European Heart Journal - Cardiovascular Imaging, 2018, 19 (6): 591-600.
- [5] Guazzi M, Naeije R. Pulmonary hypertension in heart failure: pathophysiology, pathobiology, and emerging clinical perspectives [J]. J Am Coll Cardiol, 2017, 69 (13): 1718-1734.
- [6] Vonk Noordegraaf A, Chin K M, Haddad F, et al. Pathophysiology of the right ventricle and of the pulmonary circulation in pulmonary hypertension: an update [J]. Eur Respir J, 2019, 53 (1): 1801900.

- [7] Ryan J J, Huston J, Kutty S, et al. Right ventricular adaptation and failure in pulmonary arterial hypertension [J]. Can J Cardiol, 2015, 31 (4): 391-406.
- [8] Gibbons Kroeker C A, Adeeb S, Shrive N G, et al. Compression induced by RV pressure overload decreases regional coronary blood flow in anesthetized dogs [J]. Am J Physiol Heart CircPhysiol, 2006, 290 (6): H2432-H2438.
- [9] Konstam M A, Kiernan M S, Bernstein D, et al. Evaluation and management of right-sided heart failure: a scientific statement from the American heart association [J]. Circulation, 2018, 137 (20): e578-e622.
- [10] Hayek S, Sims D B, Markham D W, et al. Assessment of right ventricular function in left ventricular assist de vice candidates [J]. Circ Cardiovasc Imaging, 2014, 7 (2): 379-389.
- [11] Biswas M, Sudhakar S, Nanda N C, et al. Two and three dimensional speckle tracking echocardiography: clinical applications and future directions [J]. Echocardiography, 2013, 30 (1): 88105.
- [12] Fine N M, Chen L, Bastiansen P M, et al. Outcome prediction by quantitative right ventricular function assessment in 575 subjects evaluated for pulmonary hypertension [J]. Circ Cardiovasc Imaging, 2013, 6 (5): 711-721.
- [13] Sachdev A, Villarraga H R, Frantz R P, et al. Right ventricular strain for prediction of survival in patients with pulmonary arterial hypertension [J]. Chest, 2011, 139 (6): 1299-1309.
- [14] 李一丹, 吕秀章, 王怡丹, 等. 右室心肌纵向应变评价肺动脉高压右室功能的临床研究 [J]. 中国超声医学杂志, 2015, 31 (10): 917-919.

• 临床研究 •

不同角膜曲率近视青少年配戴角膜塑形镜疗效对比

福建省福州东南眼科医院金山新院 (福州 350028) 何春芳 张春南

【摘要】 目的 对比不同角膜曲率患者配戴角膜塑形镜控制近视, 延缓眼轴增长的疗效。方法 采用回顾性病例分组对比研究方法, 选取 2017 年 1 月到 2020 年 12 月于我院配戴角膜塑形镜 2 年的 102 例 (204 眼) 青少年近视患者。按平坦角膜曲率分为平角膜曲率组和陡角膜曲率组两组, 分别对戴镜前和戴镜 2 年后停戴 1 个月的等效球镜度、眼轴、角膜中央厚度、角膜内皮细胞计数进行测定。结果 配戴治疗 2 年后比较, 平角膜曲率组较陡角膜曲率组的等效球镜度和眼轴均明显增加 ($P < 0.05$)。两组的角膜中央厚度和角膜内皮细胞计数分别比较, 差异均无统计学意义 ($P > 0.05$)。结论 陡角膜曲率患者配戴角膜塑形镜控制近视和眼轴增长的疗效优于平角膜曲率患者, 而角膜中央厚度和角膜内皮细胞计数变化无明显差异。及时配戴角膜塑形镜可有效控制近视和眼轴增长, 避免高度近视引起眼底并发症。

【关键词】 近视; 不同角膜曲率; 角膜塑形镜; 屈光度; 眼轴; 疗效对比

【中图分类号】 R778.11 **【文献标识码】** B **【文章编号】** 1002-2600(2022)06-0034-04

Comparison of therapeutic effects of wearing corneal shaping lens with different corneal curvature HE Chunfang, ZHANG Chunnan, Jinshan New Hospital of Fuzhou Southeast Ophthalmic Hospital, Fuzhou, Fujian 350001, Fujian

【Abstract】 Objective To compare the therapeutic effects of adolescents who suffered from different corneal curvatures by wearing a corneal shaping lens to control myopia and delay the growth of the ocular axis. **Methods** A retrospective case grouping comparative study was conducted. A total of 204 eyes of 102 adolescents with myopia admitted by our hospital were selected. These 102 adolescent patients had continuously worn corneal shaping lenses for two years from January 2017 to December 2020. The flat corneal curvature was categorized into two groups; the flat corneal membrane curvature group and the steep corneal curvature group. The equivalent sphericity, ocular axis, central corneal thickness, and corneal endothelial cell count were measured before wearing glasses. And the same tests were performed following by stopping wearing glasses for one month after two years of treatment. **Results** After two years of treatment, the equivalent sphericity and ocular axis in the flat angle membrane curvature group were significantly higher than those in the steep corneal curvature group ($P < 0.05$). Comparison of mean central corneal thickness and mean corneal endothelial cell count between the two groups was not statistically significant ($P > 0.05$). **Conclusion** The effectiveness of wearing a corneal shaping lens to control the progress of myopia and axial growth in the steep corneal curvature group was better compared with the flat angular membrane curvature group. However, there were no significant changes in central corneal thickness and corneal endothelial cell count. Wearing corneal shaping lenses in time can effectively control the progress of myopia and axial growth to avoid retinal complications caused by high myopia.

【Key words】 myopia; different corneal curvature; corneal shaping lens; diopter; eye axis; efficacy comparison