



心脏康复对心肺运动阳性的高原非阻塞性冠状动脉疾病患者 症状和生活质量的影响*

车千秋¹, 赵丽明¹, 黄宝涛², 李洪卫^{1△}

1. 西藏自治区人民政府驻成都办事处医院 心内科(成都 610041); 2. 四川大学华西医院 心内科(成都 610041)

【摘要】目的 评估心脏康复对心肺运动试验阳性的高原非阻塞性冠状动脉疾病患者症状和生活质量的影响。**方法** 通过随机对照方法,选取高原怀疑冠心病住院患者进行冠脉造影检查。根据检查结果,对非阻塞性冠状动脉疾病患者进行心肺运动试验评估,将结果为阳性的患者纳入。心肺运动试验阳性患者根据数字表、完全随机被分为两组:一组(试验组)接受心脏康复(个体化制定运动方案)+常规治疗,另一组(对照组)只接受常规治疗,在入组时和随访3个月时进行西雅图心绞痛量表(Seattle Angina Questionnaire, SAQ)和36条简明健康状况(36-item Short-Form Health Survey, SF-36)调查表评分。通过分析两组数据,评估心脏康复对心肺运动试验阳性的高原非阻塞性冠状动脉疾病患者症状和生活质量的影响。**结果** 本研究共纳入100例患者,试验组和对照组各为50例。试验组平均年龄(55.0±6.8)岁,对照组平均年龄(56.6±9.1)岁。入组时,两组在SAQ各指标上的差异均无统计学意义。然而,在3个月随访时,试验组在躯体活动受限程度(75.6±5.0 vs. 72.1±5.9)、心绞痛稳定状态(69.6±6.4 vs. 62.5±9.6)、心绞痛发作情况(70.8±9.1 vs. 65.3±9.3)、治疗满意程度(79.5±5.0 vs. 76.3±4.7)和疾病认识程度(84.9±5.2 vs. 80.4±3.8)方面的评分高于对照组($P<0.05$)。入组时,两组在SF-36各指标上的差异均无统计学意义。然而,在3个月随访时,试验组在生理功能(27.4±2.4 vs. 25.8±3.0)、生理职能(6.6±1.2 vs. 6.0±0.8)、躯体疼痛(4.7±1.3 vs. 4.1±1.0)、一般健康状况(20.2±2.2 vs. 19.0±1.8)、精力(15.8±2.1 vs. 14.5±2.1)、社会功能(7.2±1.3 vs. 6.4±1.1)、情感职能(5.2±1.1 vs. 4.7±1.2)和精神健康(22.9±2.7 vs. 20.8±2.1)评分方面均优于对照组($P<0.05$)。**结论** 心脏康复有利于改善心肺运动试验阳性的高原非阻塞性冠状动脉疾病患者症状和提高生活质量,康复期间患者均未发生不良心血管事件,其安全性和有效性得到初步验证。

【关键词】 心肺运动试验 高原 非阻塞性冠状动脉疾病 心脏康复 西雅图心绞痛量表 健康状况调查问卷

Effects of Cardiac Rehabilitation on Symptoms and Quality of Life in Cardiopulmonary Exercise Test-Positive Patients With Non-Obstructive Coronary Artery Disease From High Altitudes CHE Qianqiu¹, ZHAO Liming¹, HUANG Baotao², LI Hongwei^{1△}. 1. Department of Cardiology, Hospital of Chengdu Office of People's Government of Tibetan Autonomous Region, Chengdu 610041, China; 2. Department of Cardiology, West China Hospital, Sichuan University, Chengdu 610041, China

△ Corresponding author, E-mail: LHWLHW0717@sina.com

【Abstract】Objective To assess the effect of cardiac rehabilitation on symptoms and quality of life in patients with coronary artery disease (Non-obCAD) living at high altitudes who have positive results for cardiopulmonary exercise testing. **Methods** A randomized controlled study was conducted. Hospitalized patients with suspected coronary heart disease were enrolled for coronary angiography. Based on the angiography findings, patients with Non-obCAD underwent cardiopulmonary exercise testing, and those with positive results were included in the study. With a random number table, patients with positive results for cardiopulmonary exercise testing were assigned to two groups, an experimental group receiving cardiac rehabilitation (individualized exercise plan) plus standard treatment and a control group receiving standard treatment alone. At enrollment and the 3-months follow-up, Seattle Angina Questionnaire (SAQ) and the 36-item Short-Form Health Survey (SF-36) were used to evaluate the patients. The data of the two groups were analyzed and compared to evaluate the effect of cardiac rehabilitation on the symptoms and quality of life in Non-obCAD patients living at high altitudes who have positive results for cardiopulmonary exercise testing. **Results** A total of 100 patients were included in the study, with 50 patients in the experimental group and 50 in the control group. The mean age in the experimental group was (55.0±6.8) years, while that in the control group was (56.6±9.1) years. Notably, at

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△ 通信作者, E-mail: LHWLHW0717@sina.com

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the time of enrollment, no significant differences were found between the two groups across all the SAQ measures. However, after 3 months of follow-up, the experimental group scored higher than the control group did in terms of physical limitation (75.6 ± 5.0 vs. 72.1 ± 5.9), angina stability (69.6 ± 6.4 vs. 62.5 ± 9.6), angina frequency (70.8 ± 9.1 vs. 65.3 ± 9.3), treatment satisfaction (79.5 ± 5.0 vs. 76.3 ± 4.7), and disease perception (84.9 ± 5.2 vs. 80.4 ± 3.8), with statistically significant differences between the two groups ($P < 0.05$). At the time of enrollment, the two groups showed no significant differences in any of the SF-36 measures. However, at the 3-month follow-up, the experimental group had better scores than the control group did in physiological functioning (27.4 ± 2.4 vs. 25.8 ± 3.0), role—physical (6.6 ± 1.2 vs. 6.0 ± 0.8), bodily pain (4.7 ± 1.3 vs. 4.1 ± 1.0), general health (20.2 ± 2.2 vs. 19.0 ± 1.8), vitality (15.8 ± 2.1 vs. 14.5 ± 2.1), social functioning (7.2 ± 1.3 vs. 6.4 ± 1.1), role—emotional (5.2 ± 1.1 vs. 4.7 ± 1.2), and mental health (22.9 ± 2.7 vs. 20.8 ± 2.1) ($P < 0.05$).

Conclusion Cardiac rehabilitation is conducive to improvements in symptom and quality of life in Non-obCAD patients in high altitude areas with positive results for cardiopulmonary exercise testing. No adverse cardiovascular events occurred during the rehabilitation period, which validates preliminarily the safety and efficacy of cardiac rehabilitation in this patient population.

【Key words】 Cardiopulmonary exercise testing High altitude Non-obstructive coronary artery disease
Cardiac rehabilitation Seattle Angina Questionnaire 36-item Short-Form Health Survey

在高海拔的地区, 氧气稀薄、温度较低等特殊环境及居民的特定饮食习惯, 均是引发心血管病的危险因素。在缺氧和低气压的高海拔环境下, 由于心肌缺血和缺氧, 会导致心肌收缩力的减弱, 将会加重心脏损害。我国数据表明, 在因心绞痛接受冠状动脉造影(coronary angiography, CAG)的患者中, 约20%为非阻塞性冠状动脉疾病(non-obstructive coronary artery disease, Non-obCAD)^[1-4], 而我国现有冠心病患者1 139万^[5], 据此推测我国Non-obCAD负担较重^[6], 未能及时明确诊断和治疗的Non-obCAD患者可能面临诸多问题, 包括生活质量下降^[7], 残疾风险增加、医疗费用支出增加以及不良事件发生的风险上升等^[9]。

心肺功能运动负荷试验亦称心肺运动试验(cardiopulmonary exercise testing, CPET), 能够精确反映患者当时的病情和治疗后的疗效, CPET在心脏运动康复前用于评估风险和制定个性化运动处方, 运动后进行的CPET可关注患者提升的水平^[8-9]。心脏康复包括药物处方、运动康复、营养支持、心理管理和戒烟指导等内容, 其目的是管理和控制心脑血管疾病的危险因素, 提升运动耐力和生活质量, 减缓或阻止动脉硬化的进展, 降低心脑血管疾病急性事件的发生率, 减少全因死亡率及降低主要不良心血管事件(major adverse cardiovascular events, MACE)的发生概率^[8-13]。

目前针对高原地区大部分临床怀疑冠心病患者的诊治及预防尚不完善, 仍需进一步研究。本研究采用随机对照方法, 评估心脏康复对CPET阳性的高原Non-obCAD患者的症状和生活质量的影响, 旨在为高海拔地区Non-obCAD患者提供临床治疗指导, 以改善其症状和

生活质量, 减少心血管事件和相关死亡率, 减轻心血管病的负担。

1 资料与方法

1.1 研究对象

本研究选取了2021年12月–2023年10月于我院就诊的高原疑似冠心病患者(年龄 ≥ 18 岁), 所有患者入院后进行CAG检查。根据检查结果, 对Non-obCAD患者进行CPET评估, 将结果为阳性的患者纳入研究范围。阳性患者通过随机数字表分为两组: 试验组接受心脏康复(个体化制定运动方案)+常规治疗, 对照组只接受常规治疗, 随访3个月。本研究已通过西藏自治区人民政府驻成都办事处医院伦理委员会审查[(2022)年科研第21号]、医学研究登记备案及临床试验注册(登记号: 2022474)。本研究为随机对照试验, 通过查阅相关文献, 显著性水平 α 定为0.05, 检验效能($1 - \beta$)定为80%, 通过样本量计算软件PASS以及结合在真实研究中, 可能会存在失访/脱落等问题, 在得出的样本量基础上再增加10%~20%, 最终纳入总样本量100例。

纳入标准: ①自愿参加, 理解并签署知情同意书; ②海拔 $\geq 2\,500$ m、居住时间 ≥ 3 年; ③年龄 ≥ 18 岁且 ≤ 70 岁; ④行CAG检查及Non-obCAD患者能完成CPET。

排除标准: ①收缩压 ≥ 180 mmHg和(或)舒张压 ≥ 110 mmHg($1\text{ mmHg} = 0.133\text{ kPa}$); ②有严重心肺功能不全、严重心律失常等情况, 无法进行CPET; ③同时患有其他心脏疾病, 如扩张型心肌病、肥厚型心肌病等; ④伴有其他系统严重疾病, 如恶性肿瘤、严重肝肾疾病; ⑤近6个月内脑卒中者(其中腔隙性脑梗死除外); ⑥患有慢性阻塞

性肺疾病、深静脉血栓和肺栓塞等影响运动功能的疾病;
⑦患有骨科疾病或风湿病等影响正常运动训练的疾病。

1.2 数据收集

根据纳入、排除标准,本研究收集了患者的人口统计数据、病历信息(包括基本生命体征、合并疾病、合并用药等情况)、实验室检查、辅助检查、CPET以及CAG手术情况等。同时,在入组时和随访后3个月,本研究分别使用西雅图心绞痛量表(Seattle Angina Questionnaire, SAQ)和36条简明健康状况调查表(36-item Short-Form Health Survey, SF-36)对患者进行评分。

1.3 相关定义

1.3.1 心肺运动试验

CPET阳性组定义:平板运动试验阳性和/或氧脉搏阳性($< 80\% \text{ max/pred}$);

CPET阴性组定义:平板运动试验、氧脉搏($\geq 80\% \text{ max/pred}$)均为阴性。

1.3.2 平板运动试验阳性标准

运动中或运动后出现下列条件之一者为阳性^[14]:①运动中及运动后出现典型的心绞痛;②运动中心电图出现ST段下斜型或水平型压低 $\geq 0.1 \text{ mV}$,持续时间 $\geq 2 \text{ min}$;③如运动前心电图已有ST段压低,则运动后ST段在原水平上再压低 $\geq 0.1 \text{ mV}$,持续时间 $\geq 2 \text{ min}$;④运动中或运动后在R波占优势的导联ST段呈缺血性弓背向上型抬高 $\geq 0.1 \text{ mV}$ 。

1.3.3 氧脉搏

心脏每跳动1次机体所摄取的氧量,每搏摄氧量(氧脉搏)是每分摄氧量与同步测定的心率的比值。

1.4 干预和随访

专科康复医师根据患者的整体状况制定个性化的运动建议,包括有氧运动如步行、快走、慢跑等,运动强度和持续时间根据患者的年龄和体质量指数、CPET结果等进行调整,以保证安全且有效。患者运动量要求:患者应保持心率在70%~85%的最大心率范围内,运动时间为15~60 min,运动频率为3~5次/周。上述个性化的建议将有助于患者达到康复治疗的目标并提高其运动能力。心脏康复组分为不同类型:有氧舞蹈16人、快走12人、慢跑6人、跳操5人、骑车2人,两种有氧运动9人。常规治疗包括:生活方式管理、包含戒烟、控制体质量、饮食调整和保持愉快的心情。此外,治疗还包括控制危险因素,如降压、控制血压和血糖,以及使用抗心绞痛药物,如扩张血管药物和营养心肌代谢药物。

随访:通过使用多种沟通方式,如微信、电话、短信以及运动打卡,与受试者保持实时联系,及时记录患者的运动训练情况。每周对受试者的运动训练强度进行个性

化监督和反馈,确保试验组每周进行至少3次运动,且每次的时间和强度均符合标准。随访3个月时,采用SAQ和SF-36对两组患者进行评分。

1.5 结局指标

主要结局指标(疗效评价指标):入组时及随访3个月采用SAQ和SF-36量表评估患者症状和生活质量。SAQ包括19个条目,从不同角度评估患者的躯体活动受限程度(physical limitation, PL)、心绞痛稳定状态(angina stability, AS)、心绞痛发作情况(angina frequency, AF)、治疗满意程度(treatment satisfaction, TS)、疾病认知程度(disease perception, DP),SAQ通过为条目给予一个顺序值来评分,从1开始(1表示该功能最低水平对应的反应),然后分别对5个维度中的条目进行加和,并对每一评分进行正向化处理,每个维度满分均为100分,评分越高,患者症状改善越好^[15]。而SF-36则涵盖了36个条目,分布在8个维度和1个健康变化的自评,主要统计指标为计算8个维度的健康得分和反映健康变化的评分,计算分量表中各条目积分之和,得到分量表的粗积分,将粗积分转换为0到100的标准分,量表分数越高,表明生活质量越好^[16]。

次要结局指标:CPET前(入组时)、后(随访3个月后)变化值。

1.6 统计学方法

使用SPSS 26.0软件进行数据统计分析。对于连续数据,使用 $\bar{x} \pm s$ 或中位数及四分位数间距(IQR)描述;对于分类变量,使用率或构成比描述。在两组连续数据符合正态分布且方差齐性的情况下,采用独立样本 t 检验进行比较。若不符合正态分布,则选择秩和检验。分类变量的比较采用卡方检验。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 纳入患者基本资料、合并疾病、检查资料的比较

共1140例来自高海拔地区怀疑冠心病患者,610例接受了CAG检查。结果显示,226例患者患Non-obCAD。在随后进行CPET的185例患者中,112例CPET结果为阳性。这些患者被分成心脏康复+常规治疗组(试验组)和常规治疗组(对照组),分别为57例(脱落或中止7例)和55例(脱落5例)。最终,纳入研究的试验组和对照组分别为50例。

两组患者在年龄、性别、文化程度、基本生理指标(如血压、心率、体质量指数)方面差异无统计学意义,见表1。

两组患者均患有常见的合并症,包括2型糖尿病、高血压、高脂血症、高尿酸血症、颈动脉硬化、高原性红细

表 1 患者基本资料的比较

Table 1 Comparison of basic patient information

Item	Experimental group (n=50)	Control group (n=50)	χ^2/t	P
Age/yr.	55.0±6.8	56.6±9.1	-1.0	0.3
Male/case (%)	35 (70.0)	40 (80.0)	1.3	0.4
Basic situation				
SBP/mmHg	122.8±15.8	127.1±19.2	-1.2	0.2
DBP/mmHg	78.5±10.6	80.8±9.4	-1.0	0.3
HR/min ⁻¹	77.3±17.0	79.9±18.0	-0.8	0.4
BMI/(kg/m ²)	27.2±3.7	26.3±3.9	1.1	0.3
Educational attainment/case (%)			0.4	0.8
Primary education	14 (28.0)	17 (34.0)		
Secondary education	19 (38.0)	17 (34.0)		
Junior college or above	17 (34.0)	16 (32.0)		
Age group/case (%)			4.1	0.1
≤44 yr.	4 (8.0)	6 (12.0)		
45-59 yr.	34 (68.0)	24 (48.0)		
≥60 yr.	12 (24.0)	20 (40.0)		

SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate; BMI: body mass index.

表 2 纳入患者合并疾病、冠脉血管情况、用药的比较

Table 2 Comparison of patients' comorbidities, coronary vascular conditions, and medication

Item	Experimental group (n=50)	Control group (n=50)	χ^2	P
Type 2 diabetes mellitus/case (%)	9 (18.0)	16 (32.0)	2.6	0.2
Hypertension/case (%)	22 (44.0)	25 (50.0)	0.4	0.7
Hyperlipidemia/case (%)	13 (26.0)	16 (32.0)	0.2	0.8
Hyperuricemia/case (%)	3 (6.0)	5 (10.0)	0.5	0.7
Carotid arteriosclerosis/case (%)	14 (28.0)	16 (32.0)	0.2	0.8
Hypercythemia/case (%)	3 (6.0)	2 (4.0)	0.2	1.0
Cerebral infarction/case (%)	11 (22.0)	5 (10.0)	2.6	0.2
Coronary slow flow/case (%)			4.9	<0.05
No	16 (32.0)	27 (54.0)		
Yes	34 (68.0)	23 (46.0)		
Types of intervention drugs/case (%)			7.0	0.1
0	6 (12.0)	6 (12.0)		
1	15 (30.0)	21 (42.0)		
2	15 (30.0)	19 (38.0)		
≥3	14 (28.0)	4 (8.0)		
Number of coronary vascular lesions/case (%)			8.7	<0.05
0	1 (2.0)	1 (2.0)		
1	43 (86.0)	31 (62.0)		
2	5 (10.0)	11 (22.0)		
≥3	1 (2.0)	7 (14.0)		
Number of comorbidities/case (%)			0.2	<0.05
0	1 (2.0)	1 (2.0)		
1	43 (86.0)	31 (62.0)		
≥2	6 (12.0)	18 (36.0)		

胞增多症和脑梗死;统计结果表明,在这些疾病方面,两组患者患病率差异无统计学意义;但试验组患冠状动脉慢血流综合征的比例高于对照组($P<0.05$)。试验组和对照组在合并症数量($P<0.05$)和冠状动脉血管病变数量($P<0.05$)方面的差异均有统计学意义。在干预药物种类方面,两组之间未观察明显差异($P>0.05$)。见表2。

在入组时,试验组高密度脂蛋白胆固醇(high density lipoprotein cholesterol, HDL-C)高于对照组($P<0.05$),余实验室检查指标的组间差异无统计学意义。此外,入组时,两组患者左室射血分数和CPET结果(运动耗氧量、氧脉搏、代谢当量、最大通气量)差异均无统计学意义。见表3。

2.2 两组患者SAQ评分的比较

入组时,两组患者在PL、AS、AF、TS、DP方面差异均无统计学意义。然而,经过3个月的随访,试验组在上述方面的评分均高于对照组($P<0.05$)。见表4。

2.3 两组患者SF-36评分的比较

入组时,两组在各种指标上并未显示出明显差异

表 3 纳入患者入组时检查资料的比较

Table 3 Comparison of lab findings at the time of patient enrollment

Item	Experimental group (n=50)	Control group (n=50)	t	P
UA/(μmol/L)	344.1±91.9	362.3±85.8	-1.0	0.3
TC/(mmol/L)	4.4±0.9	4.3±1.2	0.2	0.8
TG/(mmol/L)	1.5±0.8	1.6±0.7	-0.2	0.9
HDL-C/(mmol/L)	1.2±0.2	1.1±0.2	2.2	<0.05
LDL-C/(mmol/L)	2.6±0.7	2.5±0.9	0.8	0.4
LVEF/%	65.6±3.4	65.1±5.4	0.6	0.6
Oxygen uptake during exercise	1.3±0.4	1.3±0.4	0.7	0.5
Oxygen pulse	8.8±2.3	8.8±2.3	-0.1	0.9
MET	3.6±0.7	3.6±0.7	0.3	0.8
MVV	43.0±11.3	41.9±9.9	0.5	0.6
RBC/(×10 ⁻¹² L ⁻¹)	4.9±0.9	4.8±0.6	0.8	0.4
HGB/(g/L)	150.3±22.4	148.8±20.9	0.4	0.7

UA: uric acid; HDL-C: high density lipoprotein cholesterol; TG: triglyceride; TC: total cholesterol; LDL-C: low density lipoprotein cholesterol; LVEF: left ventricular ejection fraction; MET: metabolic equivalent; MVV: maximum voluntary ventilation; RBC: red blood corpuscle; HGB: hemoglobin.

表 4 西雅图心绞痛量表 (SAQ) 的比较

Table 4 Comparison of the results for Seattle Angina Questionnaire (SAQ)

Item	Time	Experimental group (n=50)	Control group (n=50)	t/Z	P
PL	Enrollment	51.0±10.3	49.1±9.9	1.0	0.3
	Follow-up for 3 months	75.6±5.0	72.1±5.9	3.2	<0.05
AS	Enrollment	50.0±7.6	48.0±5.8	1.5	0.1
	Follow-up for 3 months	69.6±6.4	62.5±9.6	4.4	<0.001
AF	Enrollment	39.3±10.5	36.0±10.0	1.6	0.1
	Follow-up for 3 months	70.8±9.1	65.3±9.3	3.0	<0.05
TS	Enrollment	67.1±7.2	66.6±5.6	0.3	0.7
	Follow-up for 3 months	79.5±5.0	76.3±4.7	3.3	<0.05
DP	Enrollment	64.0±3.1	65.3±5.5	-1.5	0.1
	Follow-up for 3 months	85.0±5.2	80.4±3.8	5.0	<0.001

PL: physical limitation; AS: angina stability; AF: angina frequency; TS: treatment satisfaction; DP: disease perception.

($P>0.05$)。然而, 经过3个月的随访, 试验组在躯体功能 (physical functioning, PF)、生理职能 (role—physical, RP)、躯体疼痛 (bodily pain, BP)、总体健康 (general health, GH)、精力 (vitality, VT)、社会功能 (social functioning, SF)、情感职能 (role—emotional, RE) 及精神健康 (mental health, MH) 方面评分更高, 差异均有统计学意义 ($P<0.05$)。见表5。

3 讨论

本研究发现经心脏康复后试验组在躯体活动受限程

表 5 健康状况调查问卷 (SF-36) 的比较

Table 5 Comparison of the results for the 36-item Short-Form Health Survey (SF-36)

Item	Time	Experimental group (n=50)	Control group (n=50)	t/Z	P
PF	Enrollment	25.7±3.5	24.6±3.6	1.7	0.1
	Follow-up for 3 months	27.4±2.4	25.8±3.0	3.1	<0.05
RP	Enrollment	5.7±1.7	5.5±1.3	1.3	0.2
	Follow-up for 3 months	6.6±1.2	6.0±0.8	3.1	<0.05
BP	Enrollment	3.8±1.1	3.7±1.0	0.4	0.7
	Follow-up for 3 months	4.7±1.3	4.1±1.0	2.4	<0.05
GH	Enrollment	19.0±1.5	18.7±1.5	1.0	0.3
	Follow-up for 3 months	20.2±2.2	19.0±1.8	3.0	<0.05
VT	Enrollment	15.0±1.9	14.5±1.4	1.6	0.1
	Follow-up for 3 months	15.8±2.1	14.5±2.1	3.3	<0.05
SF	Enrollment	6.8±1.2	6.4±1.0	1.8	0.1
	Follow-up for 3 months	7.1±1.3	6.4±1.1	3.3	<0.05
RE	Enrollment	4.4±1.4	4.0±1.2	1.2	0.2
	Follow-up for 3 months	5.2±1.1	4.7±1.2	2.3	<0.05
MH	Enrollment	19.7±2.0	19.6±2.0	0.2	0.8
	Follow-up for 3 months	22.9±2.7	20.8±2.1	4.3	<0.001

PF: physical functioning; RP: role—physical; BP: bodily pain; GH: general health; VT: vitality; SF: social functioning; RE: role—emotional; MH: mental health.

度、心绞痛稳定状态、心绞痛发作情况、治疗满意程度和疾病认知程度方面与对照组有明显差异。此外, 试验组的生理功能、生理职能、躯体疼痛、一般健康状况、活力、社会功能、情感职能、精神健康评分较对照组均有明显提高。因此试验组患者的症状改善程度更好, 生活质量更高。同时发现所有入组患者在早期心脏康复和出院后康复以及居家康复期间未发生MACE。

冠心病是全球最常见的死亡原因^[17]。以运动为基础的 心脏康复被公认为冠心病综合管理的关键组成部分, 在国际指南中获得 I A 类推荐^[18-19]。欧美心脏病学协会已将心脏康复列为心血管疾病防治的 I 级推荐^[15-16]。根据运动频率、强度、时间和种类来制定个性化的运动处方对于心脏康复至关重要。若要长期保持积极的生活方式, 采取有效的行为改变策略是必不可少的, 而这些策略需要根据患者的具体需求进行个性化调整。

既往研究表明心脏康复对有症状的Non-obCAD患者有益, 可以改善运动能力和生活质量, 减轻症状的严重程度^[20]。研究表明, SAQ评分可以在预测死亡率、心肌梗死风险、急性冠状动脉综合征风险方面发挥重要作用, 并且对再入院和医疗费用负担也有一定的预测能力^[21-22]。研究表明, 评分在50~74、25~49和0~24的患者相较于评分75~100的患者, 1年后的死亡率有可能增加1.5倍、

2倍以及4倍。与此同时,心血管住院的风险与SAQ心绞痛频率评分息息相关。研究还发现,每月、每周、每日发作心绞痛的患者在1年内因心血管原因入院的风险分别比无心绞痛患者高出1.3倍、1.4倍和2.2倍^[23]。相关研究表明心脏康复可减少心血管疾病患者心绞痛症状的频次,提高整体生活质量^[24-25]。本研究发现,心脏康复3个月后随访,发现试验组SAQ各维度评分均较前增加,表明结局是有益的。

一项探讨心脏康复对缺血性非阻塞性冠心病合并糖尿病患者生活质量的影响,结果发现经心脏康复治疗,观察组生活质量显著高于对照组^[26],与本研究结果存在一致性。2012年一项纳入1 813例急性心肌梗死后患者的研究发现,综合康复对1年、2年或7~9年后的死亡率、心脏或心理发病率、危险因素、健康相关生活质量或活动并未带来任何有益的影响。与早期试验表明心脏康复可以降低死亡率的结论有所不同,这项研究发现心脏康复的益处证据较为薄弱,因此实行心脏康复的价值仍需进一步讨论^[27]。一项纳入179例65岁以上的冠心病或瓣膜介入治疗患者,在家进行了为期6个月的移动式心脏康复治疗,研究发现参与者的身体素质在治疗过程中得到了显著改善,并且不良事件发生率非常低且相似,表明了家庭移动心脏康复的安全性和有效性。因此,家庭移动心脏康复可能是一个良好的选择^[28]。多项研究发现心脏康复可以改善冠心病患者的生活质量,降低再次住院率、总体死亡率及MACE,为患者带来更好的长期预后,值得在临床中进一步推广应用^[29-33]。本研究采用院内指定康复运动方案,院外或居家继续实行,结果显示3个月随访时试验组患者SF-36评分明显高于对照组,说明该心脏康复方案是可行的。心脏康复在冠心病患者中的应用得到认可,建议开展综合性心脏康复计划,以达到最佳的康复效果。由于本研究随访时间短,暂未观察到全因死亡率数据,后续可继续随访观察。

基于运动的心脏康复似乎是改善冠状动脉疾病患者内皮依赖性扩张的有效治疗策略,这可能有助于预防心血管事件^[34],通过积极的身体锻炼、心理干预、行为及社会活动训练等方式改善心血管疾病患者心功能及躯体症状,预防不良心血管疾病发生。

本研究结果显示,所有入组患者在早期心脏康复和出院后康复以及居家康复期间未发生不良心血管事件,表明这种心脏康复方式的安全性和有效性得到初步验证。然而,考虑到试验的干预和随访时间较短,样本量也较少,未来研究需要进行长期随访、增加样本量并扩大研究范围,以便更深入地探讨心脏康复的长期临床益处,并

为其进一步发展提供更多的数据支持。

* * *

作者贡献声明 车千秋负责论文构思、数据审编、正式分析、调查研究、研究方法、初稿写作和审读与编辑写作,赵丽明负责论文构思、经费获取、研究项目管理和监督指导,黄宝涛负责论文构思、研究方法、监督指导和审读与编辑写作,李洪卫负责论文构思、数据审编、经费获取、调查研究、研究方法、研究项目管理和监督指导。所有作者已经同意将文章提交给本刊,且对将要发表版本进行最终定稿,并同意对工作的所有方面负责。

Author Contribution CHE Qianqiu is responsible for conceptualization, data curation, formal analysis, investigation, methodology, writing--original draft, and writing--review and editing. ZHAO Liming is responsible for conceptualization, funding acquisition, project administration, and supervision. HUANG Baotao is responsible for conceptualization, methodology, supervision, and writing--review and editing. LI Hongwei is responsible for conceptualization, data curation, funding acquisition, investigation, methodology, project administration, and supervision. All authors consented to the submission of the article to the Journal. All authors approved the final version to be published and agreed to take responsibility for all aspects of the work.

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