·临床研究·

融合心脏康复治疗对心肌梗死患者心肺运动功能和心理状态的影响

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【摘 要】 **目的** 探讨机构心脏康复联合居家康复的融合心脏康复模式对心肌梗死患者心肺功能和心理状态的影响。**方法** 纳入2017年7月至2018年3月转诊至解放军总医院第一医学中心心血管内科心脏康复中心治疗的3个月内曾患急性心肌梗死的患者84例。分为治疗组和对照组,每组42例。对照组患者于入组时进行1次健康宣教。治疗组患者采用融合心脏康复治疗:2次/周门诊运动治疗,持续18周,每次运动治疗结束后由医护人员进行15 min健康宣教,并指导患者居家运动训练计划;18周后转入完全居家康复程序,继续治疗6周。对比2组患者治疗前后的体质量指数、腰臀比、心肺运动试验指标、广泛性焦虑量表(GAD-7)及患者健康问卷(PHQ-9)评分等指标。采用SPSS 19.0软件进行数据处理。依据数据类型,组间比较分别采用 t 检验或 χ^2 检验。**结果** 组内比较:与治疗前相比,治疗后治疗组患者的腰臀比[(0.91±0.64)和(0.93±0.51)]、GAD-7评分[(2.60±3.02)和(4.69±4.61)]、PHQ-9评分[(4.14±2.54)和(6.26±3.51)]、二氧化碳通气当量斜率(VE/VCO_2 slope)[(23.46±5.09)和(25.31±4.00)]均显著降低($P<0.05$),而峰值千克摄氧量(Peak VO_2/kg)[(23.43±5.88)和(20.70±4.13)ml/(min·kg)]、最大代谢当量(MET_{max})[(6.62±1.68)和(5.92±1.18)]、氧脉搏[(13.25±4.06)和(11.78±3.48)ml/beat]均显著升高($P<0.05$)。组间比较:与对照组相比,治疗组患者治疗后的Peak VO_2/kg[(23.43±5.88)和(19.48±4.47)ml/(min·kg)]、MET_{max}[(6.62±1.68)和(5.66±1.25)]、氧脉搏[(13.25±4.06)和(11.76±0.70)ml/beat]均显著升高($P<0.05$),而腰臀比[(0.91±0.64)和(0.94±0.44)]显著降低($P<0.05$)。**结论** 融合心脏康复治疗可以提高心肌梗死患者的心肺运动功能,改善焦虑抑郁等精神障碍,值得临床推广。

【关键词】 融合心脏康复;心肌梗死;心肺运动功能;焦虑;抑郁
【中图分类号】 R541 【文献标志码】 A 【DOI】 10.11915/j.issn.1671-5403.2019.10.157

Effect of integrated cardiac rehabilitation on cardiopulmonary function and psychological status in myocardial infarction patients

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【**Abstract**】 **Objective** To explore the effect of integrated cardiac rehabilitation model (center- and home-based cardiac rehabilitation) on cardiopulmonary function and psychological status in patients with myocardial infarction. **Methods** A total of 84 cases of acute myocardial infarction within 3 months and referred to the Cardiovascular Rehabilitation Center of Chinese General Hospital of PLA from July 2017 to March 2018 were enrolled, and then randomized into treatment group and control group, with 42 patients in each group. The patients of the treatment group were treated with center-based exercise followed by health education of 15 min by medical staffs, twice a week for totally 18 weeks, and then home-based exercise for another 6 weeks. While, those in the control group were given health education for only once. Body mass index, waist-to-hip ratio, indices of cardiopulmonary exercise testing, and scores of generalized anxiety disorder (GAD-7) and patient health auestionnaire (PHQ-9) were compared before and after treatment between the 2 groups. SPSS statistics 19.0 was used to perform the statistical analysis. Student's t test or Chi-square test was employed for different data types. **Results** After 24 weeks of integrated cardiac rehabilitation, the patients of the treatment group obtained significantly lower waist-to-hip ratio [(0.91±0.64) *vs* (0.93±0.51)], GAD-7 score [(2.60±3.02) *vs* (4.69±4.61)], PHQ-9 score [(4.14±2.54) *vs* (6.26±3.51)], and minute ventilation/carbon dioxide production (VE/VCO_2) slope [(23.46±5.09) *vs* (25.31±4.00)], and obviously increased peak oxygen uptake per kilogram [Peak VO_2/kg, (23.43±5.88) *vs* (20.70±4.13) ml/(min·kg)], maximal metabolism equivalents [MET_{max}, (6.62±1.68) *vs* (5.92±1.18)], and oxygen pulse [(13.25±4.06) *vs* (11.78±3.48) ml/beat]

收稿日期:2019-09-01;**接受日期**:2019-09-27
基金项目:国家重点研发计划(2018YFC2000600)
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(all $P<0.05$). What's more, the Peak VO_2/kg [(23.43±5.88) *vs* (19.48±4.47) ml/(min · kg)], MET_{max} [(6.62±1.68) *vs* (5.66±1.25)], oxygen pulse [(13.25±4.06) *vs* (11.76±0.70) ml/beat] were notably higher, while the waist-to-hip ratio [(0.91±0.64) *vs* (0.94±0.44)] were obviously decreased in the treatment group than the control group ($P<0.05$). **Conclusion** Integrated cardiac rehabilitation can promote cardiopulmonary exercise function, improve mental disorders such as anxiety and depression, and is worthy of clinical promotion for myocardial infarction population.

【Key words】 integrated cardiac rehabilitation; myocardial infarction; cardiopulmonary exercise testing; anxiety; depression

This work was supported by the National Key R&D Program of China (2018YFC2000600).

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目前,我国心肌梗死的发病率及死亡率逐年升高,成为威胁国民健康的头号杀手[1]。虽然经皮冠状动脉介入(percutaneous coronary intervention,PCI)治疗及药物治疗降低了急性心肌梗死的死亡率[2],但心肌梗死患者的生活质量仍然不容乐观[3-6]。近年来,大量研究证据表明,心脏康复可显著降低心肌梗死的总死亡率、心脏相关死亡率,改善临床结局,提高患者日常生活质量,因此心脏康复已被多个国家和国际临床指南推荐[7]。据推测,如果心脏康复的参与率超过 70%,每年将可挽救 26000 个生命,使死亡率进一步下降 20%~30%。但是,心脏康复的参与率低及患者依从性差是目前世界各国共同面临的难题。居家康复模式因其易操作性逐渐受到广泛关注[8],但其在心肌梗死患者人群的安全性备受质疑[9]。因此,为心肌梗死患者制定符合中国国情的、经济安全有效的心脏康复模式是心内科医师面临的挑战。本研究首次探讨了机构康复结合居家康复的融合心脏康复模式在心肌梗死患者中的可行性和有效性,旨在为心肌梗死患者提供安全有效的心脏康复模式,改善其临床预后。

1 对象与方法

1.1 研究对象

纳入 2017 年 7 月至 2018 年 3 月转诊至解放军总医院第一医学中心心血管内科心脏康复中心治疗的 3 个月内曾患急性心肌梗死的患者 84 例。入选标准:(1)18~80 岁的男性或非妊娠期女性;(2)心肌梗死诊断标准符合 2017 年欧洲心脏病学会(European Society of Cardiology,ESC)急性 ST 段抬高型心肌梗死诊疗指南[10];(3)纽约心脏病学会(New York Heart Association,NYHA)心功能分级Ⅰ、Ⅱ、Ⅲ级;(4)受试者同意在未达到本试验终点前不参与其他临床试验;(5)受试者能够理解临床试验的目的,自愿参加并签署知情同意书。排除标准:(1)急性心肌梗死 2 周之内;(2)有未控制的心动过速(安静心率>120 次/min)、呼吸急促(安静时呼吸频率>30 次/min);(3)有未控制的恶性心率失常;(4)有未控制的呼吸衰竭(血氧饱和度<90%);(5)有未控制的高血糖(随机血糖>18 mmol/L);(6)有未控制的感染性休克及脓毒血症。随机化由第三方负责,将研究对象按 1∶1 的比例分配到治疗组和对照组,每组 42 例。随机分组序列由 SAS/PLAN 过程产生,随机方法采用信封法。本研究方案经解放军总医院伦理委员会批准(S2016-142-01)。

1.2 方法

对照组患者于入组时进行 1 次 30 min 的健康宣教。治疗组患者采用融合心脏康复治疗:2 次/周门诊运动治疗,持续 18 周,共计 36 次,每次运动治疗结束后由医护人员进行 15 min 健康宣教,内容包括危险因素控制、饮食用药指导及咨询,并指导患者居家运动训练计划;18 周后转入完全居家康复程序,继续治疗 6 周。运动过程包括准备活动、有氧运动、间断进行抗阻运动及放松,运动过程中保持 Borg 自我劳累程度评估量表评分在 11~14 分之间。力量训练 2~3 次/周,8~10 个肌群/次,每个肌群 2~3 组,8~10 次/组,组间间隔 1~2 min。24 周后,对比 2 组患者性别、年龄、体质量指数(body mass index,BMI)、腰臀比(waist-hip ratio,WHR)等临床指标。

1.3 观察指标

1.3.1 心肺运动试验 采用立式踏车连续递增功率方案(Cardiovit CS-200 心肺功能测试仪,席勒公司,瑞士)。操作流程:首先完成静息心电图和肺功能测定,然后在立式踏车上 3 min 静息,3 min 空踏,再根据患者的性别、年龄和估计状态,以 5~30 W/min 功率递增,使患者在 6~12 min 内达到症状限制性运动,恢复 10~20 min 结束。通过 V-slope 法计算无氧阈值,根据氧气通气当量、CO_2 通气当量、潮气末 CO_2 及氧气分压曲线适度调整。检测峰值千克摄氧量(peak oxygen uptake per kg,Peak VO_2/kg)、无氧阈千克摄氧量(oxygen uptake at anaerobic threshold per kg, VO_2-AT/kg)、最大代谢当量(maximal metabolism equivalents, MET_{max})、无氧阈时代谢当量(metabolic equivalent at AT, METAT)、氧脉搏(oxygen pulse)、二氧化碳通气当量斜率(carbon

dioxide equivalent slope, VE/VCO_2 slope)、摄氧量-功率变化(oxygen uptake to work rate increment, $\Delta VO_2/\Delta WR$)评估心肺运动功能。

1.3.2 心理自评量表 采用广泛性焦虑量表(generalized anxiety disorder-7, GAD-7)调查受试者的焦虑状态。GAD-7有7个项目组成,每个项目0~3分,总分0~21分,分值越高,焦虑状态越明显:6~9分为轻度焦虑;10~14分为中度焦虑;15~21分为重度焦虑。采用患者健康问卷(patient health questionaire-9, PHQ-9)评估受试者的抑郁状态。PHQ-9有9个项目组成,每个项目0~3分,总分0~27分,分值越高,抑郁状态越明显:6~9分为轻度抑郁;10~14分为中度抑郁;15~21分为重度抑郁;22~27分为极重度抑郁。GAD-7和PHQ-9量表由受试者本人完成,若填写过程中遇到任何问题,由具备心理咨询资质的专业人员解答。所有研究者在调查之前均进行统一的指导培训,统一指导用语。

1.4 统计学处理

采用SPSS 19.0软件进行数据处理。计量资料以均数±标准差($\bar{x}\pm s$)表示,组间比较采用t检验。计数资料以例数(百分率)表示,组间比较采用χ^2检验。$P<0.05$为差异具有统计学意义。

2 结 果

2.1 2组患者基线资料

2组患者基线资料间差异无统计学意义($P>0.05$;表1),具有可比性。

2.2 2组患者治疗前后BMI、WHR及心理状态评分比较

组内比较:与治疗前相比,治疗后治疗组患者的WHR、GAD-7和PHQ-9均显著降低($P<0.05$)。组间比较:与对照组相比,治疗组患者治疗后的WHR显著降低($P<0.05$;表2)。

2.3 2组患者治疗前后心肺运动功能的比较

组内比较:与治疗前相比,治疗后治疗组的Peak VO_2/kg、MET_{max}、氧脉搏均显著升高,而VE/VCO_2 slope显著下降,差异均具有统计学意义($P<0.05$);治疗后对照组心肺运动试验(cardio-pulmonary exercise test, CPET)各指标变化差异无统计学意义($P>0.05$)。组间比较:与对照组相比,治疗后治疗组的Peak VO_2/kg、MET_{max}、氧脉搏均显著升高,差异具有统计学意义($P<0.05$;表3)。

3 讨 论

心脏康复治疗已被证实可以改善心肌梗死患者的临床预后[9]。但中国心脏康复资源和国民心血管预防意识匮乏,乃至患者依从性较差,阻碍了心肌梗死患者心脏康复治疗的开展。居家康复因其灵活性强、易操作等特点备受关注,但心肌梗死疾病本身的复杂性和危险性决定了此类患者必须首先在医疗机构内进行心脏康复才能更好地保证患者的安全。本研究首次探索了18周机构心脏康复结合6周居家康复的融合心脏康复模式对3个月内发生过心肌梗死人群心肺运动功能和心理状态的影响。

表1 2组患者基线资料比较

Table 1 Comparison of baseline data between two groups ($n=42$)

Group	Male [n(%)]	Age (years, $\bar{x}\pm s$)	Exercise history [n(%)]	Healthy diet [n(%)]	Hypertension [n(%)]	Diabetes [n(%)]	Hyperlipidemia [n(%)]	BMI (kg/m^2, $\bar{x}\pm s$)	WHR ($\bar{x}\pm s$)
Treatment	39(92.9)	53.9±11.2	31(73.8)	32(76.2)	22(52.4)	13(31.0)	24(57.1)	25.71±3.19	0.93±0.51
Control	40(95.2)	54.4±7.8	26(61.9)	29(69.0)	17(40.5)	9(21.4)	30(71.4)	26.46±2.55	0.94±0.44

BMI: body mass index; WHR: waist-hip ratio.

表2 2组患者治疗前后BMI、WHR及心理状态评分比较

Table 2 Comparison of BMI, WHR and psychological score before and after treatment between two groups ($n=42$, $\bar{x}\pm s$)

Group	WHR		BMI(kg/m^2)		GAD-7		PHQ-9	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Treatment	0.93±0.51	0.91±0.64*#	25.71±3.19	25.39±3.07	4.69±4.61	2.60±3.02*	6.26±3.51	4.14±2.54*
Control	0.93±0.43	0.94±0.44	26.46±2.55	26.20±2.80	4.36±4.34	3.69±5.47	4.98±3.87	4.90±4.45

WHR: waist-hip ratio; BMI: body mass index; GAD-7: generalized anxiety disorder-7; PHQ-9: patient health questionaire-9. Compared with before treatment, *$P<0.05$; compared with control group, #$P<0.05$.

表 3 2 组患者治疗前后心肺运动功能的比较

Table 3 Comparison of CPET indices before and after treatment between two groups ($n=42$, $\bar{x}\pm s$)

Index	Treatment group		Control group	
	Before treatment	After treatment	Before treatment	After treatment
Peak oxygen uptake per kg[ml/(min · kg)]	20.70±4.13	23.43±5.88*#	20.03±5.15	19.48±4.47
VO_2-AT[ml/(min · kg)]	15.60±4.11	16.61±4.82	14.40±4.47	15.04±3.34
MET_{max}	5.92±1.18	6.62±1.68*#	5.52±1.57	5.66±1.25
Oxygen pulse(ml/beat)	11.78±3.48	13.25±4.06*#	11.73±3.38	11.76±0.70
VE/VCO_2 slope	25.31±4.00	23.46±5.09*	23.95±5.91	25.27±3.73
$\Delta VO_2/\Delta WR$[ml/(min · W)]	11.23±1.89	13.68±13.85	11.23±2.21	11.56±5.07

CPET: cardiopulmonary exercise test; MET_{max}: maximal metabolism equivalents; AT: anaerobic threshold; VE/VCO_2: carbon dioxide equivalent; $\triangle VO_2/\triangle WR$: oxygen uptake to work rate increment. Compared with before treatment, *$P<0.05$; compared with control group, #$P<0.05$.

超重、肥胖、WHR 与冠心病的危险因素如高血压、血脂异常、糖耐量异常等的发病率密切相关[12,13]。WHR 是判定中心性肥胖的重要指标,同时也是心血管病的独立危险因素[14,15]。本研究结果表明,治疗组治疗后,WHR 有显著性改善,与对照组比较,差异亦有统计学意义,说明融合心脏康复治疗可以有效降低心肌梗死患者的中心性肥胖问题,进而降低心血管病的危险因素。本研究发现,2 组患者组内、组间的 BMI 对比差异均无统计学意义。分析原因:康复锻炼改变的是体成分,即减少脂肪含量、增加肌肉含量,肌肉比脂肪密度大,所以,WHR 改变,而 BMI 无显著性改变。这与 Zhao 等[16]的研究结果类似。另外,样本量不足也是可能原因之一,有待进一步扩大样本量的研究。

心理障碍是冠心病的危险因素之一,也是影响冠心病预后的因素之一[17]。准确评估患者的社会心理状态对于心肌梗死患者具有重要的意义。GAD-7 和 PHQ-9 评估操作简单,特异性高,被世界卫生组织推荐用于焦虑和抑郁状态的筛查。本研究中治疗组患者治疗后的 GAD-7 和 PHQ-9 评分较治疗前有明显降低趋势,说明融合心脏康复对心肌梗死患者的焦虑、抑郁状态有一定改善。当对比治疗后 2 组患者的两种心理状态评分时,未发现明显差异,考虑可能与 2 组心肌梗死患者基线的 GAD-7 和 PHQ-9 评分不高有关,同时研究样本量不大也是可能原因之一。

CPET 是目前唯一能够一次性全面评估人体多个系统功能的临床检查技术[18],通过测量气道内的气体交换及同步评估各系统对同一运动负荷的反应情况,强调评估的整体功能和储备功能。峰值摄氧量是用来描述某些特定环境和条件下测得的摄氧量的最大值,代表最大的运动能力,是评估冠心病患者心肺功能及预后的重要指标[19],Peak VO_2/kg 则屏蔽了体质量造成的影响,是预测心血管事件的独立因子[20,21]。无氧阈是指人体在递增运动负荷过程中,有氧代谢供能开始转换成无氧代谢供能的临界点,可以反映机体耐受负荷的潜能,由心、肺、骨骼肌的功能决定[22]。氧脉搏由摄氧量除以同时间的心率计算得出,是 1 次心脏搏动摄入肺血液中的氧量,可反映心脏每搏输出量输出氧的能力。VE/VCO_2 反映了肺换气效率,是评价心肺储备的良好指标,其斜率越大,表明通气效率越低[23]。本研究结果表明,治疗组患者治疗后的 VE/VCO_2 斜率明显下降,提示康复治疗后的通气效率得到显著提高。本研究结果还表明,与治疗前相比,治疗后治疗组患者的 Peak VO_2/kg、MET_{max}、氧脉搏均显著增加,提示融合心脏康复治疗后,心肌梗死患者运动能力、心输出量、心脏储备功能、心血管效率、心肺功能明显提高。

本研究采用融合心脏康复模式对心肌梗死人群设置了 18 周 36 次的机构心脏康复运动治疗,以便于对患者施行更好的医学监测,保证其治疗的安全性;同时结合了居家康复模式,有助于提高心肌梗死患者的依从性,降低医疗费用。

综上所述,本研究首次探索的融合心脏康复模式可明显改善心肌梗死患者的身体形态、心肺运动功能及焦虑抑郁等心理状态,值得临床推广。

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(编辑: 吕青远)