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老年高血压患者衰弱与心率变异的相关性研究

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摘　要

背景：衰弱是一种常见的老年综合征，严重影响着老年人的身心健康。高血压是心血管疾病的一个独立危险因素，也是全球心血管死亡的主要原因之一。自主神经系统在血压调节和高血压的发生发展中起着重要作用。目的：探讨住院老年高血压患者衰弱与心率变异的相关性。方法：连续选取2020年10月~2021年9月在石河子大学医学院第一附属医院老年医学科及心内科住院治疗、年龄 ≥ 65岁的高血压患者416例。收集患者的一般资料和动态心电图结果，并评估心率变异性。采用FRAIL量表对患者进行衰弱评估。采用χ2检验，完全随机设计资料的方差分析探讨住院老年高血压患者心率变异对衰弱的影响。结果：根据FRAIL量表，98例(23.6%)评估为衰弱，196例(47.1%)评估为衰弱前期，122例(29.3%)评估为非衰弱。经χ2检验，非衰弱组、前衰弱组和衰弱组性别差异有统计学意义(P > 0.05)，经完全随机设计资料的方差分析，非衰弱组、衰弱组和前衰弱组年龄差异有统计学意义(P < 0.05)，进一步行LSD-t两两比较三组间差异均有统计学意义(P < 0.05)。非衰弱组、前衰弱组和衰弱组ISVT差异有统计学意义(P < 0.05)，进一步行LSD-t两两比较非衰弱组和前衰弱组差异无统计学意义(P > 0.05)，非衰弱组和衰弱组、前衰弱组和衰弱组差异均有统计学意义(P < 0.05)。非衰弱组、前衰弱组和衰弱组LVDd、LVPWT差异均无统计学意义(P > 0.05)。非衰弱组、前衰弱组和衰弱组ISVT差异有统计学意义(P < 0.05)，进一步行LSD-t两两比较非衰弱组和前衰弱组差异无统计学意义(P > 0.05)，非衰弱组和衰弱组、前衰弱组和衰弱组差异均有统计学意义(P < 0.05)。非衰弱组、前衰弱组和衰弱组LVDd、LVPWT差异均无统计学意义(P > 0.05)。结论：住院老年高血压患者心率变异性减低可能是导致其衰弱的危险因素，衰弱的发生与年龄增加呈正相关，临床医师在对高血压患者加强衰弱评估的同时，应重视心率变异性的监测。

关键词

高血压，衰弱，心率变异，老年人，住院病人

Correlation between Frailty and Heart Rate Variability in Elderly Hypertensive Patients

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Abstract

Background: Frailty is a common geriatric syndrome that seriously affects the physical and mental health of older adults. Hypertension is an independent risk factor for cardiovascular disease and one of the leading causes of cardiovascular mortality worldwide. The autonomic nervous system plays an important role in the regulation of blood pressure and the development of hypertension. Objective: To explore the correlation between frailty and heart rate variability in hospitalized elderly patients with hypertension. Methods: Consecutively, 416 hypertensive patients aged ≥65 years who were hospitalized in the Department of Geriatrics and the Department of Cardiology at the First Affiliated Hospital of Shihezi University School of Medicine from October 2020 to September 2021 were selected. General data and ambulatory ECG results of the patients were collected, and heart rate variability was assessed. The patients were assessed for frailty using the FRAIL scale. The effect of heart rate variability on frailty in hospitalized elderly patients with hypertension was explored using the χ2 test and analysis of variance with a completely randomized design data. Results: According to the FRAIL scale, 98 cases (23.6%) were assessed as debilitated, 196 cases (47.1%) were assessed as pre-debilitated, and 122 cases (29.3%) were assessed as non-debilitated. The differences in gender between the non-frail, pre-frail and frail groups were statistically significant (P > 0.05) by 2-test, and the differences in age between the non-frail, frail and pre-frail groups were statistically significant (P < 0.05) by ANOVA with completely randomized design data, and further LSD-t two-by-two comparisons were performed to show statistically significant differences between all three groups (P < 0.05). There was a statistically significant difference in ISVT between the non-debilitated, pre-debilitated and debilitated groups (P < 0.05), and there was no statistically significant difference between the non-debilitated and pre-debilitated groups (P > 0.05) for further two-by-two comparison of LSD-t, and there was a statistically significant difference between the non-debilitated and debilitated groups, and the pre-debilitated and debilitated groups (P < 0.05). The differences of LVDd and LVPWT in the non-debilitated, pre-debilitated and debilitated groups were not statistically significant (P > 0.05). The differences in ISVT between the non-debilitated, pre-debilitated and debilitated groups were statistically significant (P < 0.05), further line LSD-t two-by-two comparison showed no statistically significant differences between the non-debilitated and pre-debilitated groups (P > 0.05), and the differences between the non-debilitated and debilitated groups, pre-debilitated and debilitated groups were statistically significant (P < 0.05). The differences of LVDd and LVPWT in the non-debilitated, pre-debilitated and debilitated groups were not statistically significant (P > 0.05). Conclusion: Decreased heart rate variability in hospitalized elderly hypertensive patients may be a risk factor for their frailty, and the occurrence of frailty is positively correlated with increasing age. Clinicians should pay attention to monitoring heart rate variability while enhancing frailty assessment in hypertensive patients.

Keywords

Hypertension, Frailty, Heart Rate Variability, Aged, Inpatients

1. 引言

众所周知，高血压是心血管疾病的一个独立危险因素，也是全球心血管死亡的主要原因之一。而自主神经系统在血压调节和高血压的发生发展中起着重要作用。衰弱是一种常见的老年综合征，严重影响着老年人的身心健康。衰弱的老年人与非衰弱的老年人相比，心脏自主神经系统受损，可表现为心率变异性(Heart rate variability, HRV)的降低以及日常活动中心率(Heart rate, HR)变化的减少[1]。近年来，越来越多研究指出，自主神经对心血管系统影响的调节应在未来的研究中加以探索[2]。目前关于老年高血压患者衰弱与心率变异相关性的临床研究较少，本研究旨在分析老年高血压患者衰弱与心率变异的关系。

2. 对象与方法

2.1. 研究对象

本研究为横断面研究，连续选取 2020 年 10 月至 2021 年 9 月于石河子大学第一附属医院老年医学科及心内科住院治疗、年龄 ≥ 65 岁的高血压患者 416 例，其中男 185 例，女 231 例；年龄 75.27 ± 6.72 岁。本研究通过石河子大学医学伦理委员会批准。

纳入标准：1) 年龄 ≥ 65 岁的患者，无民族、性别及地域的限制；2) 高血压诊断符合《中国高血压防治指南(2018 修订版)》[3]的定义：在未使用降压药物的情况下，非同日 3 次测量诊室血压，SBP ≥ 140 mmHg 和(或) DBP ≥ 90 mmHg。SBP ≥ 140 mmHg 和 DBP < 90 mmHg 为单纯收缩期高血压。患者既往有高血压史，目前正在使用降压药物，血压虽然低于 140/90 mmHg，仍应诊断为高血压。3) 能够很好地语言交流，如果不能交流可由非常了解患者情况的家属代答完成衰弱评估；4) 住院期间完成动态心电图检查；排除标准：1) 不能及不愿配合相关调查及检查，如严重听力障碍、严重痴呆等；2) 继发性高血压；3) 动态心电图监测不连续；4) 急性心脑血管事件发生者；5) 严重心功能不全；6) 严重感染；7) 恶性肿瘤终末期；8) 不同意参与研究，量表信息以及评估资料不全。

2.2. 研究方法

2.2.1. 一般资料与实验室检查结果

收集研究对象性别、年龄、身高、体重、体质指数、心脏彩超等一般资料。

2.2.2. 心率变异性测定

所有患者行 24 小时动态心电图检查，采用 24 h 双通道 Holter 分析系统，连续记录 24 h ECG 后将磁带回放，自动检出 24 h 的窦性心搏，行 HRV 时域和频域分析。

2.3. 衰弱评估

采用 FRAIL 量表[4]对患者衰弱情况进行评估，该量表主要包括 5 个问题：1) 过去 4 周内大部分时间或者所有时间感到疲乏；2) 在不用任何辅助工具以及不用他人帮助的情况下，中途不休息爬 1 层楼梯有困难；3) 在不用任何辅助工具以及不用他人帮助的情况下，走完 1 个街区(100 m)较困难；4) 医生曾经告诉你存在 5 种以上如下疾病：高血压、糖尿病、癌症(非小皮肤癌)、慢性肺部疾病、心脏病、充血性心力衰竭、心绞痛、哮喘、关节炎、脑卒中和肾脏疾病等；5) 1 年或更短时间内出现体质量下降≥5%。将 5 项评估分数相加，0~2 分为非衰弱(包括无衰弱及衰弱前期)，3~5 分为衰弱。

2.4. 统计学方法

运用 SPSS 22.0 统计软件包进行统计学分析，正态分布计量资料采用均数 ± 标准差表示，计数资料采用例及构成比表示，两组间正态分布计量资料比较采用两独立样本 t 检验，计数资料比较采用χ^2检验，两组间正态分布计量资料不同时间点的重复资料比较采用重复资料方差分析，$P < 0.05$ 为差异有统计学意义。

3. 结果

1) 衰弱患者与非衰弱患者临床特征比较 根据 FRAIL 量表，98 例(23.6%)评估为衰弱，196 例(47.1%)评估为衰弱前期，122 例(29.3%)评估为非衰弱。经χ^2检验，非衰弱组、前衰弱组和衰弱组性别差异有统计学意义($P > 0.05$)，经完全随机设计资料的方差分析，非衰弱组、衰弱组和前衰弱组年龄差异有统计学意义($P < 0.05$)，进一步行 LSD-t 两两比较三组间差异均有统计学意义($P < 0.05$)，见表 1。

Table 1. Comparison of basic conditions of patients in the three groups
表 1. 三组患者基本情况比较

指标	非衰弱组	前衰弱组	衰弱组	F/χ^2 值	P 值
性别				0.467	0.792
男	55	84	46		
女	67	112	52		
年龄				234.312	< 0.001
60~69 岁	91	7	8		
70~79 岁	29	112	40		
≥80 岁	2	77	50		

2) 经完全随机设计资料的方差分析，非衰弱组、前衰弱组和衰弱组 ISVT 差异有统计学意义($P < 0.05$)，进一步行 LSD-t 两两比较非衰弱组和前衰弱组差异无统计学意义($P > 0.05$)，非衰弱组和衰弱组、前衰弱组和衰弱组差异均有统计学意义($P < 0.05$)。经完全随机设计资料的方差分析，非衰弱组、前衰弱组和衰弱组 LVDd、LVPWT 差均无统计学意义($P > 0.05$)，见表 2。

Table 2. Comparison of cardiac ultrasound in the three groups
表 2. 三组患者心脏彩超情况比较

指标	非衰弱组	前衰弱组	衰弱组	F 值	P 值
ISVT	8.97 ± 1.07	8.95 ± 1.01	9.32 ± 1.17	4.244	0.015
LVDd	44.59 ± 3.74	44.70 ± 4.40	45.38 ± 5.58	0.938	0.392
LVPWT	8.99 ± 0.88	9.00 ± 0.91	9.02 ± 1.10	0.062	0.940

3) 经完全随机设计资料的方差分析，非衰弱组、前衰弱组和衰弱组 SDNN 差异有统计学意义(P <

0.05)，进一步行 LSD-t 两两比较三组间差异均有统计学意义(P < 0.05)，经多个样本秩和检验，非衰弱组、前衰弱组和衰弱组 SDNN Index、RMSSD、PNN50、TRIA 差异均有统计学意义(P < 0.05)，进一步行两两比较三组间差异均有统计学意义(P < 0.05)，见表 3。

Table 3. Comparison of ambulatory ECG conditions in the three groups of patients
表 3. 三组患者动态心电图情况比较

指标	非衰弱组	前衰弱组	衰弱组	F 值	P 值
SDNN	133.37 ± 31.73	105.02 ± 33.13	66.82 ± 33.63	108.404	<0.001
SDNN Index	49.26 (38.40~69.45)	38.55 (31.98~46.32)	23.73 (15.74~28.56)	109.023	<0.001
RMSSD	34.72 (25.56~48.19)	29.46 (20.31~40.05)	23.20 (16.21~35.58)	27.940	<0.001
PNN50	6.31 (3.05~17.60)	3.82 (1.32~11.85)	2.14 (0.70~6.21)	34.467	<0.001
TRIA	35.32 (29.26~41.12)	26.57 (22.25~33.18)	20.74 (16.88~27.71)	103.241	<0.001

4. 讨论

有相当多的证据表明，自主神经系统在血压调节和高血压的发生发展中起着重要作用。Hiromi Mori 等[5]人的一项研究发现 HRV 水平降低和血压升高之间存在显著的相关性，且 HRV 更好地反映了舒张压而不是收缩压的水平，证实了 HRV 和亚洲人群血压之间的负相关关系。Małgorzata Maciorowska 等[6]人关于评估抗高血压治疗对高血压患者心率变异性(HRV)的影响的研究中表明，控制血压对 HRV 有有利的作用，并且在代谢综合征患者比如高血压患者中效果更明显。

衰弱被定义为一种老年综合症，它极易对健康产生不利后果，其特征是功能储备减少和对健康不良后果的高度脆弱性[7] [8]。Giuseppe Sergi 等[9]人的研究证实了衰弱前期和心血管疾病发生风险发生之间的显著关联，并指出将衰弱前期作为一种潜在的可逆的心血管疾病的风险因素，在老年人中具有重要的意义。由于衰弱的关键组成部分很难完整地捕获，因此需要易于度量和可靠的代理参数。由于虚弱影响心率变异性(HRV)，HRV 可能是这样一个替代参数。有研究证明，早期老年康复改善功能状态，这与 HRV 增加有关[10]。多项研究表明，在老年人中，虚弱与不良健康结果密切相关，包括更高的住院率和再入院率、频繁的跌倒事件、不良治疗结果、更长住院时间和更高的死亡率[11] [12] [13] [14] [15]。国外一项针对社区老年女性的研究指出，衰弱的老年妇女表现为自主神经失调，其特征是向交感神经主导转变，在衰弱管理的背景下监测自主神经功能功能可能是预防、诊断和治疗该综合征及其后果的一个重要策略[16]。Ravi Varadha 等[17]的一项关于使用回归模型评估 HRV 测量值与年龄、虚弱和 5 年死亡率的相关性的研究证实衰弱时，心脏自主控制功能受损。一篇关于衰弱状态下心脏自主神经系统控制调节的综述中指出，衰弱的老年人与非衰弱的老年人相比，心脏 ANS 受损，表现为心率动力学复杂性的降低、HRV 的降低以及日常活动中心率变化的减少[1]。

5. 结论

本研究发现，自主神经功能受损和 HRV 降低可能是高血压患者发生衰弱的潜在原因，HRV 的评估可能有助于高血压患者衰弱风险的预测。建议将衰弱评估与 HRV 监测相结合，这种方法可以更好地对这些患者的心血管风险进行分层以及对不良事件进行预防。

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