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老年体检人群心电图异常与脑血管血流动力学的关系研究

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【摘要】 目的 分析老年体检人群心电图(ECG)异常与脑血管血流动力学的关系。方法 选取2020年6—8月在上海市奉贤区金汇镇泰日社区卫生服务中心参加健康体检的6 613例老年人作为研究对象, 查阅老年人的体检资料, 记录其人口学特征(性别和年龄)、ECG异常情况、脑血管功能积分及脑血管血流动力学指标。根据ECG检查情况将老年人分为ECG异常组($n=1\ 327$)和ECG正常组($n=5\ 286$)。根据脑血管功能积分将老年人分为高危组(<75 分, $n=2\ 674$)和非高危组(≥ 75 分, $n=3\ 939$)。老年体检人群脑血管功能积分的影响因素分析采用多因素Logistic回归分析。结果 ECG异常组脑血管功能积分及左侧和右侧平均流量、脉压差低于ECG正常组, 左侧和右侧平均流速、最大流速、最小流速慢于ECG正常组, 左侧和右侧脉搏波速快于ECG正常组, 左侧和右侧特性阻抗、外周阻力、动态阻力、临界压高于ECG正常组($P<0.05$)。高危组和非高危组性别、年龄及左心室肥厚、心房颤动、陈旧性心肌梗死、ST段压低、T波低平或倒置、心肌缺血检出率比较, 差异有统计学意义($P<0.05$)。多因素Logistic回归分析结果显示, 性别[$OR=1.56$, $95\%CI(1.40, 1.74)$]、年龄[65~69岁: $OR=1.70$, $95\%CI(1.49, 1.94)$; 70~74岁: $OR=2.36$, $95\%CI(2.04, 2.74)$; 75~79岁: $OR=4.21$, $95\%CI(3.52, 5.04)$; ≥ 80 岁: $OR=9.40$, $95\%CI(6.89, 12.81)$]、左心室肥厚[$OR=5.07$, $95\%CI(2.17, 11.86)$]、心房颤动[$OR=1.68$, $95\%CI(1.10, 2.58)$]、陈旧性心肌梗死[$OR=2.05$, $95\%CI(1.18, 3.55)$]、ST段压低[$OR=1.27$, $95\%CI(1.04, 1.54)$]、T波低平或倒置[$OR=1.59$, $95\%CI(1.36, 1.86)$]是老年体检人群脑血管功能积分的独立影响因素($P<0.05$)。结论 ECG异常的老年体检人群脑血管功能积分降低, 卒中发生风险升高, 其脑血管血流动力学变化特征是运动学指标普遍降低、动力学指标普遍升高; 左心室肥厚、心房颤动、陈旧性心肌梗死、ST段压低、T波低平或倒置是老年体检人群脑血管功能积分的独立影响因素。

【关键词】 心电图描记术; 脑血管; 血流动力学; 卒中; 老年人**【中图分类号】** R 540.41 R 331.3 **【文献标识码】** A DOI: 10.12114/j.issn.1008-5971.2023.00.069

Relationship between Electrocardiogram Abnormalities and Cerebrovascular Hemodynamics in Elderly Physical Examination Population

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【Abstract】 **Objective** To analyze the relationship between electrocardiogram (ECG) abnormalities and cerebrovascular hemodynamics in elderly physical examination population. **Methods** A total of 6 613 elderly people who participated in physical examination in Tairi Community Health Service Center, Jinhui Town, Fengxian District from June to August in 2020 were selected as the research objects. The physical examination data of the elderly people were reviewed, and their demographic characteristics (gender and age), ECG abnormalities, cerebrovascular function scores and cerebral hemodynamics were recorded. According to the ECG examination results, the elderly people were divided into abnormal ECG group ($n=1\ 327$) and normal ECG group ($n=5\ 286$). According to the cerebrovascular function score, the elderly people were divided into high-risk group (<75 points, $n=2\ 674$) and non-high-risk group (≥ 75 points, $n=3\ 939$). Multivariate Logistic regression analysis was used to analyze the influencing factors of cerebrovascular function score in elderly physical examination population. **Results** The cerebrovascular function score, average flow and pulse pressure difference of the left and right sides in the abnormal ECG group were lower than those in the normal ECG group, the average flow velocity, maximum flow velocity and minimum flow velocity of left and right sides in the abnormal ECG group were slower than those in the normal ECG group, the pulse wave velocity of left and right sides in the abnormal ECG group was faster than that in the normal ECG group, the characteristic impedance, peripheral

resistance, dynamic resistance and critical pressure of left and right sides in the abnormal ECG group were higher than those in the normal ECG group ($P < 0.05$). There were statistically significant differences in gender, age and detection rates of left ventricular hypertrophy, atrial fibrillation, old myocardial infarction, ST-segment depression, low or inverted T wave and myocardial ischemia between high-risk group and non-high-risk group ($P < 0.05$). Multivariate Logistic regression analysis showed that gender [$OR=1.56, 95\%CI (1.40, 1.74)$], age [65-69 years old: $OR=1.70, 95\%CI (1.49, 1.94)$; 70-74 years old: $OR=2.36, 95\%CI (2.04, 2.74)$; 75-79 years old: $OR=4.21, 95\%CI (3.52, 5.04)$; ≥ 80 years old: $OR=9.40, 95\%CI (6.89, 12.81)$], left ventricular hypertrophy [$OR=5.07, 95\%CI (2.17, 11.86)$], atrial fibrillation [$OR=1.68, 95\%CI (1.10, 2.58)$], old myocardial infarction [$OR=2.05, 95\%CI (1.18, 3.55)$], ST segment depression [$OR=1.27, 95\%CI (1.04, 1.54)$], low or inverted T wave [$OR=1.59, 95\%CI (1.36, 1.86)$] and myocardial ischemia [$OR=1.59, 95\%CI (1.36, 1.86)$] were the independent influencing factors of cerebrovascular function score in elderly physical examination population ($P < 0.05$). **Conclusion** The cerebrovascular function score of the elderly physical examination population with ECG abnormalities is reduced, and the risk of stroke is increased. The characteristics of cerebrovascular hemodynamic changes are generally reduced kinematic indicators and generally increased kinetic indicators; left ventricular hypertrophy, atrial fibrillation, old myocardial infarction, ST segment depression, low or inverted T wave are independent influencing factors of cerebrovascular function score in elderly physical examination population.

【Key words】 Electrocardiography; Cerebrovascular; Hemodynamics; Stroke; Aged

研究表明, 心房颤动和左心室肥厚不仅是缺血性卒中的危险因素^[1], 也是《AHA/ASA卒中一级预防指南》^[2]推荐的弗莱明翰卒中风险评估量表(Framingham Stroke Profile, FSP)中的预测因子。脑血管功能积分是根据无创伤脑血管血流动力学指标异常变化情况计算出的综合积分, 可用于评估卒中发生风险^[3]。既往研究发现, 心房颤动和左心室肥厚与脑血管功能积分密切相关^[4-5], 但其他心电图(electrocardiogram, ECG)异常是否也与脑血管功能积分有关尚不清楚。本研究旨在分析老年体检人群ECG异常与脑血管血流动力学的关系, 以为ECG在卒中风险预测及卒中一级预防中的应用提供参考依据。

1 对象与方法

1.1 研究对象 选取2020年6—8月在上海市奉贤区金汇镇泰日社区卫生服务中心参加健康体检的6 613例老年人作为研究对象。纳入标准: (1) 年龄 ≥ 60 岁; (2) 体检过程中完成ECG检查和脑血管功能检测。排除标准: (1) 合并卒中者; (2) 体检资料不完整者; (3) 不愿意参加本研究者。根据ECG检查结果将老年人分为ECG异常组($n=1\ 327$)和ECG正常组($n=5\ 286$)。根据脑血管功能积分将老年人分为高危组($n=2\ 674$)和非高危组($n=3\ 939$)。

1.2 研究方法 查阅老年人的体检资料, 记录其人口学特征(性别和年龄)、ECG异常情况(满足左心室肥厚、心房颤动、陈旧性心肌梗死、ST段压低、T波低平或倒置、心肌缺血中任意一项定义为ECG异常)、脑血管功能积分及脑血管血流动力学指标。采用ECAPS 12C型心电图自动分析仪(上海光电医用电子仪器有限公司生产), 由经过培训的技术人员完成ECG检查, 由心内科医师进行复核, 并结合受检者既往病史做出明确

诊断。采用CV-3000型脑血管功能检测仪(上海神州高特医疗器械有限公司生产), 由经过统一培训的技术人员完成脑血管功能检测, 脑血管功能积分由检测仪内置软件根据脑血管血流动力学指标对卒中发病的作用权重自动计算, 分值范围0~100分, 分值越低提示患者卒中发病风险越高, 其中 ≥ 75 分为非高危, < 75 分为高危^[6]。脑血管血流动力学检测部位为双侧颈总动脉近甲状软骨上缘水平, 检测指标包括左侧和右侧平均流量、平均流速、最大流速、最小流速、脉搏波速、特性阻抗、外周阻力、动态阻力、临界压、脉压差。

1.3 统计学方法 应用SPSS 19.0统计学软件进行数据处理。脑血管血流动力学指标为计量资料, 经Kolmogorov-Smirnov法检验不符合正态分布, 以 $M(P_{25}, P_{75})$ 表示, 两组间比较采用McNemar非参数检验; 计数资料以相对数表示, 组间比较采用 χ^2 检验; 老年体检人群脑血管功能积分的影响因素分析采用多因素Logistic回归分析。以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 ECG异常组和ECG正常组脑血管功能积分和脑血管血流动力学指标比较 ECG异常组脑血管功能积分及左侧和右侧平均流量、脉压差低于ECG正常组, 左侧和右侧平均流速、最大流速、最小流速慢于ECG正常组, 左侧和右侧脉搏波速快于ECG正常组, 左侧和右侧特性阻抗、外周阻力、动态阻力、临界压高于ECG正常组, 差异有统计学意义($P < 0.05$), 见表1。

2.2 高危组和非高危组人口学特征和ECG异常情况比较 高危组和非高危组性别、年龄及左心室肥厚、心房颤动、陈旧性心肌梗死、ST段压低、T波低平或倒置、心肌缺血检出率比较, 差异有统计学意义($P < 0.05$), 见表2。

表3 老年体检人群脑血管功能积分影响因素的多因素Logistic回归分析**Table 3** Multivariate Logistic regression analysis of influencing factors of cerebrovascular function score in elderly physical examination population

变量	β	SE	Wald χ^2 值	P值	OR (95%CI)
性别	0.445	0.054	68.13	<0.01	1.56 (1.40, 1.74)
年龄 (以60~64岁为参照)					
65~69岁	0.529	0.068	59.92	<0.01	1.70 (1.49, 1.94)
70~74岁	0.859	0.075	130.10	<0.01	2.36 (2.04, 2.74)
75~79岁	1.438	0.091	248.04	<0.01	4.21 (3.52, 5.04)
≥80岁	2.240	0.158	200.78	<0.01	9.40 (6.89, 12.81)
左心室肥厚	1.624	0.433	14.05	<0.01	5.07 (2.17, 11.86)
心房颤动	0.521	0.218	5.70	0.02	1.68 (1.10, 2.58)
陈旧性心肌梗死	0.716	0.281	6.49	0.01	2.05 (1.18, 3.55)
ST段压低	0.236	0.101	5.43	0.02	1.27 (1.04, 1.54)
T波低平或倒置	0.463	0.080	33.90	<0.01	1.59 (1.36, 1.86)
常数项	-1.372	0.062	497.01	<0.01	-

注: -表示无此项数据

及心肌缺血与卒中发病风险关系的研究鲜见报道。本研究结果显示, ST段压低、T波低平或倒置、心肌缺血是老年体检人群脑血管功能积分的独立影响因素。本研究结果还显示, ECG异常组脑血管功能积分及左侧和右侧平均流量、脉压差低于ECG正常组, 左侧和右侧平均流速、最大流速、最小流速慢于ECG正常组, 左侧和右侧脉搏波速快于ECG正常组, 左侧和右侧特性阻抗、外周阻力、动态阻力、临界压高于ECG正常组, 提示ECG异常的老年体检人群脑血管功能积分降低, 卒中发生风险升高, 其脑血管血流动力学变化特征是运动学指标(流量和流速)降低、动力学指标(压力和阻抗等)升高。

综上所述, ECG异常的老年体检人群脑血管功能积分降低, 卒中发生风险升高, 其脑血管血流动力学变化特征是运动学指标普遍降低、动力学指标普遍升高; 左心室肥厚、心房颤动、陈旧性心肌梗死、ST段压低、T波低平或倒置是老年体检人群脑血管功能积分的独立影响因素。提示在卒中风险评估和一级预防实践中, 均应关注ECG异常情况。由于本研究中ECG和脑血管功能检测均在同一时间点进行, 研究结果只能说明两者之间有关, 并不能说明二者之间的因果关系。

作者贡献: 黄久仪进行文章的构思与设计; 顾桢茂、陈庆华、王艳、余虹、郭吉平、徐佩玉进行研究的实施与可行性分析; 顾桢茂、黄久仪进行数据收集、整理、分析, 结果分析与解释, 负责撰写、修订论文; 黄久仪负责文章的质量控制及审校, 并对文章整体负责、监督管理。

本文无利益冲突。

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