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早期原发性高血压患者血管内皮功能与颈动脉弹性功能、 颈动脉内 - 中膜厚度的相关性研究 *

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摘要 目的:研究早期原发性高血压患者血管内皮功能与颈动脉弹性功能、颈动脉内 - 中膜厚度(IMT)的相关性。**方法:**选取 2017 年 4 月至 2018 年 5 月福建医科大学附属宁德市医院收治的早期原发性高血压患者 80 例为研究对象,记为研究组,另选取同期于我院进行体检的健康志愿者 69 例记为对照组,采用彩色超声诊断仪分别检测并比较两组受试者血管内皮功能、颈动脉弹性功能和 IMT,并采用 Pearson 相关性分析早期原发性高血压患者血管内皮功能与颈动脉弹性功能参数和颈动脉 IMT 的相关性。**结果:**与对照组比较,研究组基础内径明显增厚,内皮依赖性血管扩张值(FMD)明显降低($P<0.05$),而两组内皮非依赖性血管扩张值(NMD)比较差异无统计学意义($P>0.05$)。与对照组比较,研究组顺应性(AC)均明显降低,而硬度指数、压力应变弹性系数(Ep)、IMT 明显升高,差异有统计学意义($P<0.05$)。经 Pearson 相关性分析显示,早期原发性高血压患者 FMD 与 AC 呈正相关,与硬度指数、Ep、IMT 呈负相关($P<0.05$),而 NMD 与硬度指数、Ep、AC、IMT 无相关性($P>0.05$)。**结论:**早期原发性高血压患者血管内皮功能明显受损、颈动脉弹性功能下降、IMT 增厚,同时,患者血管内皮功能受损与颈动脉弹性功能下降、IMT 增厚密切相关。

关键词:原发性高血压;早期;内皮功能;颈动脉弹性功能;内 - 中膜厚度;相关性

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Early Essential Hypertension: Correlation between Vascular Endothelial Function and Carotid Artery Elasticity, Carotid Artery Intima-media Thickness*

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ABSTRACT Objective: To study the correlation between vascular endothelial function and carotid artery elasticity function and carotid artery intima-media thickness (IMT) in patients with early essential hypertension. **Methods:** A total of 80 patients with early essential hypertension, who were treated in Affiliated Ningde Hospital of Fujian Medical University from April 2017 to May 2018, were chosen as study group. Another 69 healthy persons, who received physical examination in Affiliated Ningde Hospital during the same period, were chosen as control group. The vascular endothelial function, carotid artery elasticity function and IMT were detected by color ultrasound diagnostic apparatus and were compared between the two groups. Pearson correlation analysis was used to analyze the correlation between vascular endothelial function and carotid artery elasticity function parameters and IMT in the patients with early essential hypertension. **Results:** Compared with the control group, the basal diameter of the study group was significantly thickened, and flow-mediated dilation (FMD) was significantly decreased ($P<0.05$). There was no significant difference in nitroglycerin-mediated dilation (NMD) between the two groups ($P>0.05$). Compared with the control group, the arterial compliance (AC) of the study group was significantly decreased, while the hardness index, the pressure strain elasticity coefficient (Ep) and IMT were significantly increased, and the difference was statistically significant ($P<0.05$). Pearson correlation analysis showed that FMD was positively correlated with AC in the patients with early hypertension and was negatively correlated with hardness index, Ep and IMT ($P<0.05$). There was no correlation between NMD and hardness index, Ep, AC, IMT ($P>0.05$). **Conclusion:** Vascular endothelial function is significantly impaired in the patients with early essential hypertension, and carotid artery elasticity function is decreased, IMT is more thickening. At the same time, impaired vascular endothelial function is associated with decreased carotid artery elasticity function and IMT thickening.

Key words: Essential hypertension; Early; Endothelial function; Carotid artery elasticity function; Intima-media thickness; Correlation

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前言

原发性高血压是指以血压持续升高为主要表现的临床常见疾病,占高血压患者的90%左右,其确切病因尚不清楚,临床上多认为是由环境和遗传等因素相互作用造成^[1,2]。动脉粥样硬化是原发性高血压的主要病变特征之一,因此此类患者容易发生心肌梗死、脑卒中等心脑血管事件,严重威胁患者的生命安全^[3,4]。血管内皮功能受损是早期原发性高血压的主要表现,发生于动脉粥样硬化之前,其参与了冠心病、心力衰竭、心肌梗死等心血管疾病的发生与发展^[5,6]。颈动脉是动脉粥样硬化最常累及的部位之一,存在动脉粥样硬化的患者将造成颈动脉弹性功能降低^[7]。而颈动脉弹性是指由颈动脉应力变化导致的血流容量改变,其异常变化是血管内皮功能受损的综合表现,可作为心血管疾病早期表现的预测指标^[8]。颈动脉内-中膜厚度(intima-media thickness, IMT)增厚是全身动脉粥样硬化的早期特征,IMT也是判断动脉硬化的常见指标^[9]。既往研究发现^[10],原发性高血压患者动脉血管结构和功能的改变是发生动脉粥样硬化的基础,因此,早期原发性高血压患者动脉功能的检测以及对其血管病变的干预具有重要的意义。本研究通过分析早期原发性高血压患者血管内皮功能与颈动脉弹性功能、颈动脉IMT的相关性,以期为中心脑血管疾病的早期诊断提供临床依据,总结如下。

1 资料与方法

1.1 一般资料

选取2017年4月至2018年5月福建医科大学附属宁德市医院收治的早期原发性高血压患者80例为研究对象,记为研究组,纳入标准:(1)所有患者均根据《中国高血压防治指南》^[11]中的诊断标准确诊;(2)均为初次确诊,且还未服用降压相关药物;(3)患者及其家属对本研究知情同意,并签署同意书。排除标准:(1)合并心脑血管疾病、糖尿病、泌尿系统、神经系统、代谢系统疾病者;(2)继发性高血压患者;(3)有酗酒、吸烟习惯者;(4)肝肾功能不全者;(5)伴有恶性肿瘤和自身免疫性疾病者;(6)体质质量超标者。研究组男性49例,女性31例;年龄35-75岁,平均(56.23±8.65)岁;病程3-24个月,平均(12.35±3.68)个月;收缩压18.67-24.00Kpa或舒张压12-14.53Kpa。另选取同期于我院进行体检的健康志愿者69例记为对照组,其中男性48例,女性21例;年龄36-78岁,平均(55.98±7.35)岁。两组患者在性别比例、年龄构成等方面比较无统计学差异($P>0.05$),均衡可比。本研究符合我院伦理委员会的相关规定。

1.2 方法

采用飞利浦IU22彩色超声诊断仪(产地:荷兰,探头频率设置为5-12MHz)检测所有受试者的肱动脉内皮功能指标[内皮依赖性血管扩张值(flow-mediated dilation, FMD)、内皮非依赖性血管扩张值(nitroglycerin-mediated dilation, NMD)]、颈动脉弹性功能参数[硬度指数、压力应变弹性系数(pressure strain elasticity coefficient, Ep)、顺应性(arterial compliance, AC)]以及颈动脉IMT。

1.2.1 肱动脉内皮功能 受试者休息10 min之后,取仰卧位,手臂向外伸展15度,掌心向上,记录此时的心电图情况。选择

上肢肘关节以上2-15 cm范围内最直的一段肱动脉(长度在1 cm以上)采用超声诊断仪以先横向、后纵向的方式进行扫描,使肱动脉图像清晰显示前后内膜,并在舒张末期(即心电图R波的顶点)测量前后内膜之间的距离,选三个周期,取平均值作为基础内径值,记为D1。完成以上操作后行反应行充血试验,用血压袖带捆住受试者肱动脉上段,并充气加压至37.24 Kpa持续3 min,随后突然放气,在放气后15 s内测量肱动脉前后内膜之间的距离,记为D2。休息15 min待血管恢复后,给受试者0.5 g的硝酸甘油,舌下含服,10 min后重复测量操作,并将此时的肱动脉前后内膜之间的距离记为D3。分别根据 $FMD=(D2-D1)/D1 \times 100\%$ 和 $NMD=(D3-D1)/D1 \times 100\%$ 计算FMD、NMD值。

1.2.2 颈动脉弹性功能和IMT 受试者休息10 min之后,取仰卧位,绑上血压袖带,测量3次上肢血压,取3次的平均值作为最后的血压值。同步连接心电图,采用超声诊断仪测量受试者IMT,分别测量5次,将5次的平均值作为最后的IMT值。在二维模式下,当颈动脉中段纵断面处于最大断面时开启ET模式,调节M取样线使之与颈动脉壁垂直,以确保获得准确的血管内径和最佳图像。随后将取样门置于颈动脉中膜和外膜的交界处,并叮嘱受试者屏住呼吸,此时系统将自动记录至少6个稳定的血管内径变化图像。取图像上5个以上基线稳定的波形,并输入测定好的血压值,采用e-DMS系统自动计算硬度指数、Ep、AC等颈动脉弹性功能参数。

1.3 统计学处理

采用SPSS23.0统计学软件对研究数据进行处理。计量资料以($\bar{x} \pm s$)表示,行t检验;计数资料以[n(%)]表示,行 χ^2 检验,采用Pearson相关性分析早期原发性高血压患者血管内皮功能与颈动脉弹性功能参数和颈动脉IMT的相关性。 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组血管内皮功能比较

与对照组比较,研究组基础内径明显增厚,FMD明显降低($P<0.05$),而两组NMD比较差异无统计学意义($P>0.05$)。详见表1。

2.2 两组颈动脉弹性功能和IMT比较

与对照组比较,研究组AC明显降低,而硬度指数、Ep、IMT明显升高,差异有统计学意义($P<0.05$)。详见表2。

2.3 早期原发性高血压患者血管内皮功能与颈动脉弹性功能参数和IMT的相关性

经Pearson相关性分析显示,早期原发性高血压患者FMD与AC呈正相关,与硬度指数、Ep、IMT呈负相关($P<0.05$),而NMD与硬度指数、Ep、AC、IMT无相关性($P>0.05$)。详见表3。

3 讨论

随着人们生活方式以及饮食习惯的改变,我国心脑血管疾病的发生率不断升高,同时危险因素也明显上升,高血压作为心脑血管疾病的第一危险因素,其具有高发病率和呈年轻化趋势的特点,已成为人们健康的“第一杀手”^[12]。原发性高血压是高血压的主要类型,其多见于中老年群体,具有发病隐匿、病情

表 1 两组血管内皮功能比较($\bar{x} \pm s$)Table 1 Comparison of vascular endothelial function between two groups($\bar{x} \pm s$)

Groups	n	FMD(%)	NMD(%)	Base diameter(mm)
Study group	80	8.05± 1.69	15.12± 1.62	5.08± 0.23
Control group	69	13.91± 1.82	14.98± 1.47	4.03± 0.15
t		20.366	0.549	32.430
P		0.000	0.584	0.000

表 2 两组颈动脉弹性功能和 IMT 比较($\bar{x} \pm s$)Table 2 Comparison of carotid artery elasticity function and IMT between two groups($\bar{x} \pm s$)

Groups	n	Hardness index	Ep(Kpa)	AC(mm ² /Kpa)	IMT(mm)
Study group	80	15.76± 2.65	186.56± 38.72	0.63± 0.22	1.21± 0.12
Control group	69	7.08± 1.79	74.98± 42.09	1.52± 0.59	0.69± 0.25
t		23.697	23.896	3.787	16.533
P		0.000	0.000	0.000	0.000

表 3 早期原发性高血压患者血管内皮功能与颈动脉弹性功能参数和 IMT 的相关性分析

Table 3 Correlation analysis between vascular endothelial function and carotid artery elastic function parameters and IMT in patients with early essential hypertension

Indexes	Hardness index		Ep		AC		IMT	
	r	P	r	P	r	P	r	P
FMD	-0.529	0.000	-0.483	0.002	0.516	0.000	-0.469	0.003
NMD	-0.204	0.592	-0.197	0.625	0.186	0.714	-0.152	0.762

进展缓慢的特点,是临床常见的慢性疾病^[13,14]。早期原发性高血压患者症状较少,常因体检或其他疾病检查时才被发现,但原发性高血压患者在早期就常因血压的持续升高而将导致血管结构和功能受到损伤,进而发展为动脉粥样硬化,因此其早期检测显得尤为重要^[15]。超声诊断是通过超声技术检测人体内部组织结构和形态变化并对疾病作出相应提示的一种检测手段,其具有方便、直观、无通和无创等特点^[16]。多数研究表明^[17,18],原发性高血压患者在动脉粥样硬化之前其血管内皮功能已被损伤,而血管内皮功能损伤常表现为血管弹性功能和 IMT 厚度的变化,因此,研究原发性高血压患者血管内皮功能与颈动脉弹性功能、颈动脉 IMT 的相关性具有重要的临床意义。

本研究经超声检测结果显示,与对照组比较,研究组基础内径明显增厚,FMD 明显降低($P<0.05$)。提示早期原发性高血压患者存在血管内皮功能损伤。血管内皮功能损伤主要表现为内皮依赖性舒张功能障碍,而内皮依赖性舒张功能障碍则采用 FMD 的变化体现^[19]。正常的血管内皮细胞通过分泌内皮素、血栓素以及释放一氧化氮的方式以维持血管壁的完整性和正常功能,由于原发性高血压患者持续的血压升高导致一氧化氮等舒张因子水平下降,使得血管内收缩和舒张因子分泌不协调,且收缩因子占主要地位,从而使得患者 FMD 明显降低,进而导致患者血管内皮功能受损^[20-22]。而两组 NMD 比较差异无统计学意义($P>0.05$),可能是因为硝酸甘油引起的舒张不需要经血管内皮功能起作用,其释放的一氧化氮也不会影响血管的结构和功能发生变化,因而,两者所得结果无差异^[23]。本研究结果还

显示,与对照组比较,研究组 AC 均明显降低,而硬度指数、Ep、IMT 明显升高($P<0.05$)。说明早期原发性高血压患者颈动脉弹性功能明显降低,同时颈动脉 IMT 明显增厚。颈动脉弹性功能参数中,硬度指数用于反映颈动脉血管的硬化程度,其值越高代表血管硬化越严重;Ep 反映的是动脉血管的弹性,当血管发生硬化时,其值将升高;AC 代表的是血管的顺应性,当血管发生硬化时,其值将降低^[24-26]。颈动脉 IMT 能够反映早期原发性高血压患者血管内膜被脂质浸润的程度,同时可以直观显示动脉硬化程度和斑块形成情况^[27,28]。高血压患者脂质浸润动脉内膜壁,内膜上的巨噬细胞和平滑肌细胞吸收脂质后变成泡沫细胞,并在血管壁上堆积,导致患者发生动脉粥样硬化^[29]。另外,经 Pearson 相关性分析显示,早期原发性高血压患者 FMD 与 AC 呈正相关,与硬度指数、Ep、IMT 呈负相关($P<0.05$),说明血管内皮功能受损与患者颈动脉弹性功能、颈动脉 IMT 存在密切联系。早期原发性高血压患者由于血压不断升高,导致血管内皮功能的受损,从而使得血管硬化,进而导致血管弹性、应变性均发生相应的变化;同时,患者血管内皮功能受损,致使血管平滑肌细胞增生和血小板聚集的能力均降低,从而使得内膜变得粗糙并不断增厚,进而导致颈动脉 IMT 明显增厚^[30]。

综上所述,早期原发性高血压患者存在明显的血管内皮功能损伤、颈动脉弹性功能降低以及颈动脉 IMT 增厚现象,且三者之间存在密切联系,相互影响共同促进患者动脉粥样硬化的形成,通过超声检测患者三者指标变化情况,可以诊断患者病情。

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