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维持性血液透析患者血浆容量与血压关系的研究

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[摘要] **目的** 探讨维持性血液透析患者透析过程中血浆容量变化与血压的关系。**方法** 36 例维持性血液透析患者根据透析前血压水平分为正常血压组($n=16$)和高血压组($n=20$)。记录透析前后患者的血压和体质量,检测血清总蛋白水平并计算血浆容量变化值(△PV)。所有数据采用 SPSS 13.0 软件进行统计学分析。**结果** 在正常血压组,透析前后收缩压分别为(123.3 ± 19.9) mmHg (1 mmHg = 0.133 kPa)和(122.3 ± 27.0)mmHg,舒张压分别为(69.6 ± 9.2) mmHg 和(70.9 ± 17.0) mmHg,透析前后收缩压和舒张压比较差异均无统计学意义($P>0.05$);透析过程中,体质量变化值为(2.7 ± 1.4)kg,△PV 为(14.7 ± 10.8)%。在高血压组,透析前后收缩压分别为(162.6 ± 16.2) mmHg 和(148.2 ± 31.1)mmHg,透析前后舒张压分别为(86.6 ± 9.6) mmHg 和(82.1 ± 14.4) mmHg,透析后收缩压较透析前显著下降($P<0.05$),而透析前后舒张压比较差异无统计学意义($P>0.05$);透析过程中,体质量变化值为(3.2 ± 1.3)kg,△PV 为(20.4 ± 14.4)%。相关性分析结果显示:正常血压组和高血压组患者透析前后血压与透析过程中的△PV 和体质量变化均无显著相关性($P>0.05$)。**结论** 透析过程中,血浆容量改变未对患者透析前后血压变化产生显著影响;体质量下降尚不足以确切反映患者血浆容量状态,且用于预示透析前后血压变化的作用有限。

[关键词] 维持性血液透析;血浆容量;血压;体质量
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Clinical study on relationship between plasma volume and blood pressure in patients undergoing chronic hemodialysis

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[Abstract] ***Objective*** To explore the association between plasma volume and blood pressure during hemodialysis in patients undergoing chronic hemodialysis. ***Methods*** Thirty-six patients undergoing chronic hemodialysis were divided into normotensive group ($n=16$) and hypertensive group ($n=20$) according to blood pressure before hemodialysis. The blood pressure and body weight before hemodialysis and after hemodialysis were recorded, and serum total protein concentrations were measured to determine the changes of plasma volumes (△PV). Statistical analysis was performed with SPSS 13.0 software. ***Results*** In normotensive group, the systolic pressure was (123.3 ± 19.9) mmHg (1 mmHg = 0.133 kPa) before hemodialysis and (122.3 ± 27.0) mmHg after hemodialysis, the diastolic pressure was (69.6 ± 9.2) mmHg before hemodialysis and (70.9 ± 17.0) mmHg after hemodialysis, and there was no significant difference between systolic pressure and diastolic pressure before hemodialysis and those after hemodialysis ($P>0.05$). During hemodialysis in normotensive group, the change of body weight was (2.7 ± 1.4) kg, and △PV was (14.7 ± 10.8)%. In hypertensive group, the systolic pressure was (162.6 ± 16.2) mmHg before hemodialysis and (148.2 ± 31.1) mmHg after hemodialysis, the diastolic pressure was (86.6 ± 9.6) mmHg before hemodialysis and (82.1 ± 14.4) mmHg after hemodialysis, the systolic pressure after hemodialysis was significantly lower than that before hemodialysis ($P<0.05$), while there was no significant difference between diastolic pressure before hemodialysis and that after hemodialysis ($P>0.05$). During hemodialysis in hypertensive group, the change of body weight was (3.2 ± 1.3) kg, and △PV was (20.4 ± 14.4)%. Correlation analysis revealed that blood pressure before hemodialysis and after hemodialysis in hypertensive group and normotensive group was not significantly related to △PV and changes of body weight during hemodialysis ($P>0.05$). ***Conclusion*** During hemodialysis, changes in plasma volume do not influence changes in blood pressure before hemodialysis and after hemodialysis, and reduction in body weight is insufficient to reflect the changes of plasma volume and may be of limited effect to predict the changes in blood pressure before hemodialysis and after hemodialysis.

[Key words] chronic hemodialysis; plasma volume; blood pressure; body weight

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高血压是终末期肾衰竭(end-stage renal disease, ESRD)维持性血液透析患者最常见的并发症之一,会增加透析患者心血管疾病的患病率和病死率,是影响血液透析患者预后的独立危险因素[1]。维持性血液透析患者高血压的发病机制很多,其中肾素和容量是两个重要的因素,而通常容量过多又被认为是最主要的原因[2]。既往对维持性血液透析患者透析间期或透析过程中体质量下降对血压影响的评估结论不一。本研究观察维持性血液透析患者透析过程中体质量和血浆容量变化对血压的影响,初步探讨其在血液透析临床实践中的作用。

1 对象与方法

1.1 对象和分组

选取2009年3月—8月在上海交通大学医学院附属仁济医院肾脏科血液净化中心因ESRD接受维持性血液透析治疗的患者36例作为研究对象。所有患者均使用Fresenius透析机,F7HPS透析器和聚砜膜,透析膜面积1.6 m^2,应用碳酸氢盐透析液,血流量200~300 mL/min,透析液流量500 mL/min,透析频率2~3次/周,透析时间10~12 h/周,所有患者均选择与前次透析间隔2 d的透析作为观察研究点。36例患者根据透析前血压水平分为正常血压组($n=16$,血压≤140 mmHg/90 mmHg)(1 mmHg=0.133 kPa)和高血压组($n=20$,血压>140 mmHg/90 mmHg)。

1.2 检测指标

分别于透析前后记录患者的血压和体质量;检测透析前后血清总蛋白(serum total protein, STP)水平,并按公式[3]计算血浆容量变化值(△PV)。$\triangle PV=[(STP_{透析后}-STP_{透析前})/STP_{透析后}]\times 100\%$。

1.3 统计学方法

采用SPSS 13.0软件包进行统计学分析。计量资料以 $\bar{x}\pm s$ 表示,两组间比较采用 t 检验;计数资料以频数和百分率表示,组间比较采用 χ^2 检验或Fisher精确检验。用Spearman单因素相关分析评价维持性血液透析患者透析前后△PV和体质量变化与血压的相关性。$P<0.05$ 表明差异有统计学意义。

2 结果

2.1 一般情况

36例维持性血液透析患者中,男性20例,女性16例;年龄27~81岁,平均年龄(58.0±14.0)岁;透析龄1~15年,平均透析龄(6.0±3.9)年。正常血压组患者原发病包括慢性肾小球肾炎6例,多囊肾、高血压肾硬化、糖尿病肾病、狼疮性肾炎、梗阻性肾病各1例,原因不明5例;高血压组原发病包括慢性肾小球肾炎8例,高血压肾硬化2例,多囊肾、糖尿病肾病、狼疮性肾炎、类风湿性关节炎相关性肾病各1例,原因不明6例。两组患者性别、年龄和透析龄比较差异均无统计学意义($P>0.05$)(表1)。

表1 患者基本资料

Tab 1 Basic data of patients

项目	正常血压组($n=16$)	高血压组($n=20$)	总体($n=36$)
平均年龄/岁	58.9±14.8	57.3±13.6	58.0±14.0
平均透析龄/年	6.2±4.4	5.9±3.6	6.0±3.9
男性患者/(n,%)	9(56.0)	11(55.0)	20(55.6)
服用降压药患者/(n,%)	8(50.0)	17(85.0)①	25(69.4)

① $P<0.05$ 与正常血压组比较。

2.2 透析前后的血压、体质量和△PV

两组透析前后的血压、体质量和△PV情况详见表2。统计学分析结果显示:在正常血压组,透析前后的收缩压和舒张压比较差异均无统计学意义($P>0.05$);透析过程中体质量变化值和△PV分别为(2.7±1.4)kg和(14.7±10.8)%。在高血压组,透析后收缩压显著低于透析前($P<0.05$),而透析前后的舒张压比较差异无统计学意义($P>0.05$);透析过程中体质量变化值和△PV分别为(3.2±1.3)kg和(20.4±14.4)%。组间比较结果显示:两组间透析前后的收缩压以及透析前的舒张压比较,差异均有统计学意义($P<0.05$),而两组间透析前后的体质量变化值及△PV比较,差异均无统计学意义($P>0.05$)。

表2 两组患者透析前后的血压、体质量和△PV

Tab 2 Blood pressure, body weight and △PV before hemodialysis and after hemodialysis

指标	正常血压组($n=16$)	高血压组($n=20$)
收缩压/mmHg		
透析前	123.3±19.9	162.6±16.2②
透析后	122.3±27.0	148.2±31.1①②
舒张压/mmHg		
透析前	69.6±9.2	86.6±9.6②
透析后	70.9±17.0	82.1±14.4
体质量/kg		
透析前	58.0±76.6	59.8±12.5
透析后	55.3±6.8	56.6±12.1
变化值	2.7±1.4	3.2±1.3
△PV/%	14.7±10.8	20.4±14.4

注:体质量变化值=透析前体质量-透析后体质量;① $P<0.05$ 与透析前比较;② $P<0.05$ 与正常血压组比较。

2.3　相关性分析结果

Spearman 单因素相关分析结果显示:两组患者透析前后的收缩压、舒张压与△PV 和体质量变化值无显著相关性($P>0.05$)(表 3、4)。

表 3　正常血压组透析前后血压与体质量变化值和△PV 的相关性

Tab 3　Correlation of blood pressure with changes in body weight and △PV before hemodialysis and after hemodialysis in normotensive group

变量	透析前收缩压	透析后收缩压	△收缩压	透析前舒张压	透析后舒张压	△舒张压	透析前体质量	透析后体质量	△体质量
透析后收缩压	$r=0.755$ $P=0.001$								
△收缩压	$r=0.023$ $P=0.934$	$r=0.673$ $P=0.004$							
透析前舒张压	$r=0.621$ $P=0.001$	$r=0.534$ $P=0.033$	$r=0.114$ $P=0.675$						
透析后舒张压	$r=0.679$ $P=0.040$	$r=0.858$ $P=0.000$	$r=-0.542$ $P=0.030$	$r=0.082$ $P=0.000$					
△舒张压	$r=0.527$ $P=0.030$	$r=0.873$ $P=0.000$	$r=0.736$ $P=0.001$	$r=0.402$ $P=0.122$	$r=0.870$ $P=0.000$				
透析前体质量	$r=0.385$ $P=0.141$	$r=0.331$ $P=0.211$	$r=-0.070$ $P=0.796$	$r=0.102$ $P=0.708$	$r=0.309$ $P=0.245$	$r=0.389$ $P=0.137$			
透析后体质量	$r=0.337$ $P=0.201$	$r=0.268$ $P=0.315$	$r=0.028$ $P=0.917$	$r=0.101$ $P=0.709$	$r=0.290$ $P=0.275$	$r=0.361$ $P=0.169$	$r=0.987$ $P=0.000$		
△体质量	$r=0.453$ $P=0.078$	$r=0.494$ $P=0.052$	$r=-0.242$ $P=0.366$	$r=-0.062$ $P=0.821$	$r=0.268$ $P=0.315$	$r=0.360$ $P=0.171$	$r=0.646$ $P=0.007$	$r=0.517$ $P=0.040$	
△PV	$r=-0.042$ $P=0.878$	$r=0.134$ $P=0.621$	$r=-0.157$ $P=0.561$	$r=0.371$ $P=0.157$	$r=0.088$ $P=0.745$	$r=0.170$ $P=0.528$	$r=0.230$ $P=0.934$	$r=-0.071$ $P=0.793$	$r=0.466$ $P=0.069$

表 4　高血压组透析前后血压与体质量变化和△PV 的相关性

Tab 4　Correlation of blood pressure with changes in body weight and △PV before hemodialysis and after hemodialysis in hypertensive group

变量	透析前收缩压	透析后收缩压	△收缩压	透析前舒张压	透析后舒张压	△舒张压	透析前体质量	透析后体质量	△体质量
透析后收缩压	$r=0.678$ $P=0.001$								
△收缩压	$r=-0.210$ $P=0.374$	$r=-0.861$ $P=0.000$							
透析前舒张压	$r=0.004$ $P=0.987$	$r=0.183$ $P=0.563$	$r=0.171$ $P=0.472$						
透析后舒张压	$r=0.258$ $P=0.272$	$r=0.743$ $P=0.000$	$r=-0.810$ $P=0.000$	$r=0.213$ $P=0.368$					
△舒张压	$r=-0.242$ $P=0.304$	$r=-0.775$ $P=0.000$	$r=0.863$ $P=0.000$	$r=0.421$ $P=0.064$	$r=-0.796$ $P=0.000$				
透析前体质量	$r=-0.173$ $P=0.466$	$r=0.176$ $P=0.459$	$r=-0.353$ $P=0.126$	$r=0.059$ $P=0.805$	$r=0.430$ $P=0.059$	$r=-0.362$ $P=0.117$			
透析后体质量	$r=-0.183$ $P=0.441$	$r=0.174$ $P=0.463$	$r=-0.358$ $P=0.121$	$r=0.032$ $P=0.894$	$r=0.415$ $P=0.069$	$r=-0.365$ $P=0.113$	$r=0.994$ $P=0.000$		
△体质量	$r=0.050$ $P=0.833$	$r=0.052$ $P=0.829$	$r=-0.034$ $P=0.887$	$r=0.263$ $P=0.265$	$r=0.229$ $P=0.331$	$r=-0.051$ $P=0.831$	$r=0.273$ $P=0.245$	$r=0.169$ $P=0.475$	
△PV	$r=0.430$ $P=0.059$	$r=-0.392$ $P=0.087$	$r=0.171$ $P=0.472$	$r=0.138$ $P=0.563$	$r=0.177$ $P=0.456$	$r=0.249$ $P=0.289$	$r=0.063$ $P=0.792$	$r=0.150$ $P=0.835$	$r=0.135$ $P=0.570$

3　讨　论

心血管疾病是 ESRD 维持性血液透析患者的常见并发症之一。美国肾脏病数据系统的资料显示,ESRD 透析患者心血管疾病的病死率是同龄普通人群的 15 ~ 30 倍[4],而降低血压可降低心血管疾病的患病率及病死率[5]。高血压是维持性血液透析患者最常见的并发症之一,多种因素可导致透析患者发

生高血压。既往研究[6]表明,透析间期每增加1%干体质量,透析前收缩压可升高1 mmHg,透析过程中收缩压变化将增加1.08 mmHg。Lins等[7]研究提示,透析中血浆容量的降低可能比体质量降低能更好地预测透析中收缩压下降。Leypoldt等[3]研究表明,透析中血浆容量降低与透析前和透析后收缩压降低显著相关。而Ibrahim等[8]研究发现,透析中血浆容量的变化与透析前和透析后的血压无显著相关性。血液透析程中血浆容量的改变可否作为透析前后患者容量负荷变化的监测指标,这是近年来血液透析临床实践中令人关注的问题之一。本研究结果显示:血液透析能有效降低透析前血压升高患者的收缩压,减少透析患者容量负荷,这与Charra等[9]的研究结果相符;同时,研究发现患者透析前后的收缩压和舒张压变化与透析过程中体质量和血浆容量的变化无显著相关性,这与Ibrahim等[8]和Krepel等[10]的研究结果相似。

血液透析患者血压和血浆容量改变的这种不一致现象以往也有研究[11,12]报道。Charra等[13]认为,血液透析患者血压和血浆容量变化受多种因素影响,不呈线性相关。影响血液透析过程中血浆容量状况的因素包括一些血管活性因子、血液透析的剂量及患者心功能状况等[14]。患者透析中有效循环容量的维持是血液透析中多种因素对血浆容量影响的结果,包括心收缩力、血管阻力和血管再充盈等。透析中血管再充盈与超滤率、患者本身状况有关,如体表面积、液体负荷、血浆容量和血浆蛋白浓度等[15]。血液透析过程中的血压变化除容量因素外,还受肾素-血管紧张素系统、交感神经、钠平衡等其他因素影响[16]。另外,Charra等[13]还提出,血液透析患者血压与容量改变不呈线性相关现象,与血液透析患者外周血管阻力的逐渐改变滞后于细胞外容量改变有关,即所谓的"滞后现象"。上述这些因素均可对本研究透析过程中患者血浆容量与血压改变产生影响。

综上所述,维持性血液透析患者透析过程中血浆容量的改变未对患者透析前后血压变化产生显著影响,患者透析过程中体质量的下降尚不足以确切反映患者容量状态,且用于预示透析前后血压变化的作用有限。由于本研究中采用间接方法计算总的血容量,对于透析过程中患者容量的变化通过透析前后的变化值进行测定,未对整个透析过程中的容量变化进行连续监测;同时,本研究样本量较小,故尚需今后扩大样本进行深入研究。

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