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糖尿病足患者肾功能和营养状态及脂质代谢与溃疡严重程度的关系*

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摘要 目的:探讨糖尿病足患者肾功能和营养状态及脂质代谢与溃疡严重程度的相关性。**方法:**选取 2015 年 8 月-2017 年 12 月期间我院收治的糖尿病足患者 389 例为研究对象,根据 Wagner 分级将患者分为 1 级组 52 例,2 级组 84 例,3 级组 96 例,4 级组 129 例,5 级组 28 例,对比分析五组患者肾功能指标[血肌酐(Scr)、胱抑素 C(Cys C)、尿素氮(BUN)]、营养状态指标[体重指数(BMI)、血红蛋白(Hb)、血清白蛋白(Alb)]、血脂指标[甘油三酯(TG)、高密度脂蛋白胆固醇(HDL-C)]水平,并分析 Wagner 分级与以上指标的相关性。**结果:**不同 Wagner 分级患者性别、年龄、BUN 水平比较差异无统计学意义($P>0.05$);2 级组、3 级组、4 级组、5 级组患者的 BMI、TG、HDL-C、Hb、Alb 水平低于 1 级组,Scr、Cys C 水平、吸烟史及高血压所占比例高于 1 级组($P<0.05$);4 级组、5 级组患者的 BMI、TG、HDL-C、Hb、Alb 水平低于 2 级组、3 级组,Scr、Cys C 水平、吸烟史及高血压所占比例高于 2 级组、3 级组($P<0.05$)。经 Spearman 相关性分析显示,Wagner 分级与 Scr、Cys C 呈正相关,与 TG、HDL-C、Hb、Alb、BMI 呈负相关($P<0.05$)。**结论:**糖尿病足患者 Scr、Cys C 与溃疡严重程度存在正相关关系,TG、HDL-C、Hb、Alb、BMI 均与溃疡严重程度存在负相关关系。

关键词:糖尿病足;溃疡严重程度;肾功能;营养状态;脂质代谢

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Relationship between Renal Function, Nutritional Status, Lipid Metabolism and the Severity of Ulcer in Patients with Diabetic Foot*

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ABSTRACT Objective: To investigate the correlation between renal function, nutritional status, lipid metabolism and the severity of ulcer in patients with diabetic foot. **Methods:** 389 patients with diabetic foot who were admitted to our hospital from August 2015 to December 2017 were selected as the research object, according to the classification of Wagner, the patients were divided into class 1 group with 52 cases, class 2 group with 84 cases, class 3 group with 96 cases, class 4 group with 129 cases, class 5 group with 28 cases, the renal function indexes[serum creatinine (Scr), Cystatin C (Cys C), urea nitrogen (BUN)], nutritional status index [body mass index (BMI), hemoglobin (Hb), serum albumin (Alb) and blood lipid index], Blood lipid index [triglyceride (TG), high density lipoprotein cholesterol (HDL-C)], and the correlation between Wagner classification and the above index were analyzed. **Results:** There was no significant difference in gender, age and BUN level in different Wagner classification patients ($P>0.05$). The BMI, TG, HDL-C, Hb and Alb levels in the class 2 group, class 3 group, class 4 group, class 5 group were lower than those in the class 1 group, the proportion of Scr, Cys C, smoking history and hypertension were higher than those of class 1 group ($P<0.05$). The BMI, TG, HDL-C, Hb and Alb in the class 4 group, class 5 group were lower than those in the class 2 group and class 3 group, the proportion of Scr, Cys C, smoking history and hypertension were higher than those of class 2 group and class 3 group ($P<0.05$). The Spearman correlation analysis showed that Wagner classification was positively correlated with Scr and Cys C, and negatively correlated with TG, HDL-C, Hb, Alb and BMI ($P<0.05$). **Conclusion:** There is a positive correlation between Scr, Cys C and the severity of ulceration in diabetic foot patients, TG, HDL-C, Hb, Alb and BMI are all negatively correlated with the severity of ulcers.

Key words: Diabetic foot; Severity of ulcer; Renal function; Nutritional status; Lipid Metabolism

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前言

近年来,随着人们生活方式及饮食结构的改变,糖尿病的

发生率呈逐年上升的趋势^[1,2]。糖尿病足是糖尿病患者严重的并发症之一,具有较高的致死率及致残率,每年在我国的发生率为 2%-3%^[3]。糖尿病足主要是由神经病变、下肢血管病变等共

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同导致的结果,可累及关节、骨、皮肤等各层组织,其中糖尿病足溃疡是其最为常见的临床表现,若不及时治疗,患者需进行截肢处理,严重者甚至会出现死亡^[4-6]。目前,临床上评估糖尿病足严重程度的方法较多,Wagner 分级是目前国际上认可的分级方法,据相关研究显示,Wagner 分级与糖尿病足患者的预后具有明显相关性,但该分级方法没有涉及相关临床指标在糖尿病足发生与发展中的作用^[7-9]。因此本研究主要是对不同 Wagner 分级糖尿病足患者肾功能指标和营养状态指标及血脂指标的表达式进行对比分析,旨在为临床防治糖尿病足提供依据,现作如下报道。

1 资料与方法

1.1 一般资料

选取 2015 年 8 月 -2017 年 12 月期间我院收治的糖尿病足患者 389 例为研究对象。纳入标准:(1)符合中华医学会糖尿病分会制定的糖尿病足诊断标准^[10];(2)无认知功能障碍者;(3)近期末接受糖皮质激素治疗者;(4)自愿参与本次研究,并签署知情同意书。排除标准:(1)伴有严重肝肾功能不全者;(2)伴有恶性肿瘤者;(3)伴有严重慢性消耗性疾病者;(4)伴有糖尿病急性并发症者。389 例患者中男 246 例,女 143 例,年龄 35-78 岁,平均(54.89±9.13)岁,糖尿病病程 4-15 年,平均(9.72±3.18)年,足病病程 0-78 个月,平均(57.39±8.42)个月,根据 Wagner 分级将患者分为 1 级组 52 例,2 级组 84 例,3 级组 96 例,4 级组 129 例,5 级组 28 例。本研究经医院伦理委员会审批通过。

1.2 方法

收集所有入选患者的一般资料,包括性别、年龄、体质量指数(body mass index,BMI)、吸烟史、糖尿病慢性并发症如高血压等。并检测患者肾功能指标[肌酐(serum creatinine,Scr)、

胱抑素 C(Cystatin C,Cys C)、血尿素氮(Blood urea nitrogen,BUN)、营养状态指标[血红蛋白(hemoglobin,Hb)、血清白蛋白(albumin,Alb)]、血脂指标[甘油三酯(trilaurate glycerin,TG)、高密度脂蛋白胆固醇(high density lipoprotein cholesterol,HDL-C)]水平。指标检测方法:抽取患者空腹静脉血 5 mL,其中 Scr、Cys C、BUN、TG、HDL-C 检测应用日立 7600 全自动生化分析仪(日本日立公司)进行,Hb、Alb 应用 DxH800 血细胞分析仪(美国贝克曼库尔特)检测。

1.3 观察指标

对比不同 Wagner 分级患者的一般资料及 Scr、Cys C、BUN、TG、HDL-C、Hb、Alb 水平,并分析各指标与 Wagner 分级的相关性。

1.4 统计学方法

采用 SPSS19.0 统计学软件,计量资料均以($\bar{x} \pm s$)的形式表示,组间对比经 t 检验分析,多组间对比经方差分析,计数资料以%的形式表示,经 χ^2 检验分析,各指标与 Wagner 分级的相关性分析采用 Spearman 相关分析,以 $P < 0.05$ 时表明差异有统计学意义。

2 结果

2.1 不同 Wagner 分级患者一般资料对比

不同 Wagner 分级患者性别、年龄比较差异无统计学意义($P > 0.05$),BMI、吸烟史及高血压比较差异有统计学意义($P < 0.05$);2 级组、3 级组、4 级组、5 级组患者的 BMI 低于 1 级组,吸烟史及高血压所占比例高于 1 级组($P < 0.05$);4 级组、5 级组患者的 BMI 低于 2 级组、3 级组,吸烟史及高血压所占比例高于 2 级组、3 级组($P < 0.05$);2 级组与 3 级组、4 级组与 5 级组患者的 BMI、吸烟史及高血压所占比例比较差异无统计学意义($P > 0.05$)。见表 1。

表 1 不同 Wagner 分级患者一般资料对比

Table 1 Comparison of general data in patients with different Wagner grades

Groups	n	Male[n(%)]	Age(years)	BMI(kg/m ²)	Smoking history [n(%)]	Hypertension[n(%)]
Class 1 group	52	30(57.69)	63.71±8.97	24.97±5.32	17(32.69)	15(28.85)
Class 2 group	84	51(60.71)	64.12±9.09	23.88±4.12*	40(47.62)*	34(40.48)*
Class 3 group	96	68(70.83)	63.09±8.52	23.56±3.97*	49(51.04)*	42(43.75)*
Class 4 group	129	84(65.12)	65.33±9.46	22.87±4.01* [#]	80(62.02)* [#]	69(53.49)* [#]
Class 5 group	28	13(46.43)	66.78±9.87	21.94±3.29* [#]	19(67.86)* [#]	15(53.57)* [#]
F/χ^2		0.412	0.978	10.874	15.329	18.165
P		0.769	0.539	0.012	0.007	0.003

Notes: Compared with the class 1 group, * $P < 0.05$; compared with the class 2 group, $P < 0.05$; compared with the class 3 group, $P < 0.05$.

2.2 不同 Wagner 分级患者肾功能、营养状态指标及血脂指标对比

不同 Wagner 分级患者之间 BUN 水平比较差异无统计学意义($P > 0.05$),Scr、Cys C、G、HDL-C、Hb、Alb 水平比较差异有统计学意义($P < 0.05$);2 级组、3 级组、4 级组、5 级组患者的 TG、HDL-C、Hb、Alb 水平低于 1 级组,Scr、Cys C 水平高于 1 级组($P < 0.05$);4 级组、5 级组患者的 TG、HDL-C、Hb、Alb 水平

低于 2 级组、3 级组,Scr、Cys C 水平高于 2 级组、3 级组($P < 0.05$);2 级组与 3 级组、4 级组与 5 级组患者的 Scr、Cys C、TG、HDL-C、Hb、Alb 水平比较差异无统计学意义($P > 0.05$)。见表 2。

2.3 各指标与 Wagner 分级相关性分析

经 Spearman 相关性分析显示,Wagner 分级与 Scr、Cys C 呈正相关,与 TG、HDL-C、Hb、Alb、BMI 呈负相关($P < 0.05$),见表 3。

表 2 不同 Wagner 分级患者肾功能、营养状态指标及血脂指标对比($\bar{x} \pm s$)Table 2 Comparison of renal function, nutritional status index and blood lipid index in patients with different Wagner classification($\bar{x} \pm s$)

Groups	n	Scr($\mu\text{mol/L}$)	Cys C(mg/L)	BUN(mmol/L)	TG(mmol/L)	HDL-C(mmol/L)	Hb(g/L)	Alb(g/L)
Class 1 group	52	68.72 $\pm$ 12.33	1.08 $\pm$ 0.29	6.30 $\pm$ 1.53	1.75 $\pm$ 0.42	1.42 $\pm$ 0.43	125.42 $\pm$ 18.33	42.78 $\pm$ 4.12
Class 2 group	84	74.19 $\pm$ 12.69*	1.24 $\pm$ 0.38*	6.45 $\pm$ 1.48	1.45 $\pm$ 0.45*	1.21 $\pm$ 0.40*	113.53 $\pm$ 19.14*	37.12 $\pm$ 3.87*
Class 3 group	96	74.28 $\pm$ 13.14*	1.42 $\pm$ 0.39*	6.51 $\pm$ 1.77	1.42 $\pm$ 0.31*	1.19 $\pm$ 0.25*	112.06 $\pm$ 18.87*	36.49 $\pm$ 3.46*
Class 4 group	129	81.33 $\pm$ 14.72* [#]	1.59 $\pm$ 0.51* [#]	6.49 $\pm$ 1.87	1.15 $\pm$ 0.14* ^{#&}	1.07 $\pm$ 0.26* ^{#&}	101.72 $\pm$ 16.45* ^{#&}	34.58 $\pm$ 1.67* ^{#&}
Class 5 group	28	84.19 $\pm$ 15.67* [#]	1.61 $\pm$ 0.54* [#]	6.53 $\pm$ 1.92	1.13 $\pm$ 0.15* ^{#&}	1.05 $\pm$ 0.21* [#]	99.79 $\pm$ 16.13* ^{#&}	34.12 $\pm$ 1.85* ^{#&}
F		18.358	9.372	0.397	8.518	7.927	20.459	14.372
P		0.004	0.019	0.912	0.024	0.029	0.002	0.008

Notes: Compared with the class 1 group, * $P < 0.05$; compared with the class 2 group, * $P < 0.05$; compared with the class 3 group, [#] $P < 0.05$.

表 3 各指标与 Wagner 分级相关性分析

Table 3 Correlation Analysis of each index and Wagner classification

Indexes	r	P
Scr	0.387	0.000
Cys C	0.204	0.008
TG	-0.152	0.000
HDL-C	-0.128	0.000
Hb	-0.249	0.001
Alb	-0.298	0.000
BMI	-0.076	0.005

3 讨论

糖尿病足是糖尿病患者晚期较为严重的并发症,足溃疡是糖尿病足患者最为常见的并发症,具有治疗难度大、病死率及致残率高等特点,给患者及其家庭带来沉重的负担,而且严重威胁患者的生命健康,因此在临床工作中必须加强对糖尿病足患者的筛查,并积极给予治疗^[11-13]。科学的溃疡分级系统能够有效的指导临床治疗糖尿病足溃疡,并能有效的预测患者的结局^[14]。Wagner 分级因其简单实用,而在国内外成为糖尿病足溃疡最常用的分级方法,但是 Wagner 分级的基础是坏疽范围及溃疡深度^[15,16],为了进一步提高 Wagner 分级在糖尿病足患者中的应用价值,本研究对不同 Wagner 分级糖尿病足患者肾功能指标、营养状态、血脂指标的表达式进行对比分析。

本研究结果显示,2 级组、3 级组、4 级组、5 级组患者的 BMI 低于 1 级组,吸烟史及高血压所占比例高于 1 级组;4 级组、5 级组患者的 BMI 低于 2 级组、3 级组,吸烟史及高血压所占比例高于 2 级组、3 级组,说明具有吸烟史及高血压可能是使糖尿病足患者溃疡严重程度加重的影响因素。Scr、Cys C、BUN 均是可反映机体肾功能的有效指标^[17,18],均能够反映肾脏的滤过能力,当机体肾功能损伤时,以上指标则会升高;BMI、Hb、Alb 是反映全身营养状态的指标^[19-21],当机体出现营养不良

时 BMI、Hb、Alb 水平将会随之降低;TG、HDL-C 是反映机体血脂水平的指标,也可以反映机体蛋白质代谢情况,当机体出现营养不良时 TG、HDL-C 水平也会下降。此外,2 级组、3 级组、4 级组、5 级组患者的 TG、HDL-C、Hb、Alb 水平低于 1 级组,Scr、Cys C 水平高于 1 级组;4 级组、5 级组患者的 TG、HDL-C、Hb、Alb 水平低于 2 级组、3 级组,Scr、Cys C 水平高于 2 级组、3 级组,说明随着糖尿病足患者溃疡严重程度升高,其肾功能、营养状态及血脂水平均随之降低。经 Spearman 相关性分析显示,Wagner 分级与 Scr、Cys C 呈正相关,与 TG、HDL-C、Hb、Alb、BMI 呈负相关,说明 Scr、Cys C、TG、HDL-C、Hb、Alb、BMI 均与糖尿病足患者溃疡严重程度相关,结合以上结果分析其原因主要是因为 Wagner 分级较高的患者血糖水平控制较差,而高血糖水平极可能会引发糖尿病肾病,当患者肾脏功能越差时,患者的血管内修复功能则越弱,周围神经病变则会越严重,加重足溃疡的严重程度,Scr、Cys C 水平也会随之升高^[22-24];充足的营养是创面愈合的重要因素,细胞的移行、增殖、生长因子、蛋白质及激素的合成均依赖于营养的充足,当机体营养不良时则会导致皮肤变薄,极易形成溃疡,导致促生长因子缺乏,肉芽组织也会发育不良,使创面长时间不能够愈合,增加了细菌侵入的机会^[25-27],导致溃疡的严重程度增加,Wagner 分级越高的患者多合并营养不良,因此随着 Wagner 分级升高 Hb、Alb 水

平及 BMI 降低;TG、HDL-C 作为反映机体蛋白质代谢情况的指标,其水平降低与机体营养不良有关,因此随着 Wagner 分级升高 TG、HDL-C 水平也随之降低^[28-30]。但是本研究未对患者进行随访,对患者预后情况尚不清楚,在今后的研究中需对不同预后患者以上指标进行对比分析,进一步扩大研究中心,从而进行更深入的分析。

综上所述,糖尿病足患者 Scr、Cys C、TG、HDL-C、Hb、Alb、BMI 均与其溃疡严重程度存在明显相关性,在临床治疗中,以上指标可以发挥预测溃疡严重程度的作用,并能指导对糖尿病足患者的治疗,评价患者预后。

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