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· 心血管病学基础与临床研究 ·

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**【摘要】** 目的 探讨冠状动脉粥样硬化性心脏病(以下简称冠心病)患者可溶性高级糖基化终末产物受体(soluble receptor for advanced glycation end products,sRAGE)浓度和肾功能的相关性。方法 在行冠状动脉造影确诊冠心病的人群中,根据估算的肾小球滤过率(estimated glomerular filtration rate,eGFR)分为肾功能正常组和肾功能下降组,比较2组临床特征、sRAGE浓度,采用Spearman相关及Logistic回归分析血浆sRAGE浓度和肾功能的相关性。结果 本研究共纳入170例冠心病患者,相关性分析结果提示sRAGE与肌酐呈正相关( $r=0.152, P=0.048$ ),sRAGE与尿素氮呈正相关( $r=0.160, P=0.038$ ),sRAGE与eGFR呈负相关( $r=-0.185, P=0.016$ )。肾功能正常组109例,肾功能下降组61例。与肾功能正常组相比,肾功能下降组sRAGE浓度增加[( $2.00 \pm 0.61$ )  $\mu\text{g/L}$  vs ( $1.70 \pm 0.60$ )  $\mu\text{g/L}$ ],差异有统计学意义( $P=0.003$ )。多因素Logistic回归分析提示sRAGE是冠心病患者肾功能下降的关联指标( $OR=2.954, 95\% CI: 1.030 \sim 8.474, P=0.044$ )。结论 血浆sRAGE浓度可能在冠心病伴发肾功能下降中具有潜在指示物的作用。

**【关键词】** 可溶性高级糖基化终末产物受体;冠状动脉粥样硬化性心脏病;肾功能

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## Correlation analysis of soluble advanced glycation end product receptors and renal function in patients with coronary atherosclerotic heart disease

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**【Abstract】 Objective** To evaluate the correlation between soluble receptor for advanced glycation end products (sRAGE) and renal function in patients with coronary atherosclerotic heart disease (CHD). **Methods** This study was a cross-sectional study. Plasma sRAGE and renal function indexes were detected in patients diagnosed with CHD who underwent coronary angiography in hospital. According to estimated glomerular filtration rate (eGFR), patients were divided into normal renal function group and decreased renal function group. Clinical characteristics and sRAGE levels of the two groups were compared, and the correlation between plasma sRAGE levels and renal function was analyzed by Spearman correlation and Logistic regression. **Results** A total of 170 patients were enrolled in the study. Correlation analysis showed that sRAGE was positively correlated to creatinine ( $r=0.152, P=0.048$ ) and blood urea nitrogen ( $r=0.160, P=0.038$ ), but negatively correlated to eGFR ( $r=-0.185, P=0.016$ ). There were 109 patients in normal renal function group and 61 patients in decreased renal function group. Compared with the normal renal function group, sRAGE level was increased [( $2.00 \pm 0.61$ )  $\mu\text{g/L}$  vs ( $1.70 \pm 0.60$ )  $\mu\text{g/L}$ ,  $P=0.003$ ] in the decreased renal function group. Multivariate Logistic regression analysis showed that sRAGE was correlated to decreased renal function in patients with CHD ( $OR=2.954, 95\% CI: 1.030 \sim 8.474, P=0.044$ ). **Conclusion** Plasma sRAGE might be a potential indicator for decreased renal function in CHD patients.

**【Key words】** soluble receptor for advanced glycation end products; coronary heart atherosclerotic disease; renal function

我国冠状动脉粥样硬化性心脏病(以下简称冠心病)患病率和病死率逐年上升<sup>[1]</sup>,在冠心病发病过程中会伴有肾损害甚至肾功能下降,一旦合并肾功能下降预后更差。目前,传统的心血管危险因素如高血

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、高血糖、高血压、高尿酸血症、高脂血症、肾脏基

可溶性高级糖基化终末产物受体(soluble receptor for advanced glycation end products, sRAGE)可以... 肾功能下... 冠心病患者中... 肾功能下的... 性... 报。研究... 冠心病患者... 血 sRAGE 和肾功能... 的... 性, 肾功能... 肾功能下... 中探讨 sRAGE... 研究...

1 对象与方法

1.1 研究对象

2018年5月-12月 冠状动脉 的 冠心病患者170 研究, 的肾 (estimated glomerular filtration rate, eGFR), 中 eGFR < 90 mL · min<sup>-1</sup> · 1.73 m<sup>-2</sup> 病 (肾功能下), eGFR ≥ 90 mL · min<sup>-1</sup> · 1.73 m<sup>-2</sup> (肾功能) [5]。 :①拟 冠心病接受冠状动脉 术;②年龄 ≥ 18 岁。排除 :①严重的肝、肾功能不全;②急、慢性感染性 病;③恶性肿瘤;④ 血流动力学 的严重瓣膜病;⑤ 髓骨血 或凝血功能 。冠心病定 少存 1 支主要冠状动脉血管 或 支 ≥ 50%。心 定 国《急性 ST 高 心 和 (2019)》[6]和《 ST 高 急性冠状动脉 和 (2016)》[7]。 研究 患者, 医院 同 ( 学 :KJ 2018-101-02), 研究 同。

1.2 基线资料收集

患者年龄、性、体 (body mass index, BMI), 病, 体, 血糖、血 (serum creatinine, SCr)、血 (blood urea nitrogen, BUN)、血、糖化血 (glycosylated hemoglobin A1c, HbA1c)、 、 、 糖。eGFR 慢性肾脏病流 病学 (Chronic Kidney Disease Epidemiology Collaboration, CKD - EPI)。

1.3 临床检测

(1)血 sRAGE 定: 患者 冠状动脉

血 2 mL 凝管中,以 3 000 r/min 心 10 min 血 -80 ℃ 存 中,以 附 (enzyme linked immunosorbent assay, ELISA) 血 sRAGE 浓度, sRAGE ELISA 自 国 Aviscera Bioscience。

(2)冠状动脉 : Judkin's , 体、 冠状动脉 2 科 家 同 病 血管的 度。以 2 家 不 考 第3 家。

(3)冠状动脉病 严重 度:以 SYNTAX , http://www.syntaxscore.com SYNTAX 高 冠状动脉病 严重。 患者的 病 的和 [8]。

1.4 统计学方法

SPSS 25.0 学 。以 Kolmogorov-Smirnov test 性, 的 ± (x̄ ± s), 的 “中 ” [M(P<sub>25</sub>, P<sub>75</sub>)] , 中 Mann-Whitney U 。 “ ( )”, χ<sup>2</sup> 或 Fisher 。 Spearman 性 , Logistic 学 。以 P < 0.05

2 结果

2.1 入 基线资料

研究 冠心病患者 170 。 患者基 、 病、冠心病、体、 1。

2.2 sRAGE 与 的 关 分

冠心病患者 sRAGE、 肾功能 SCr、 BUN、eGFR 性, sRAGE、 SCr (r=0.152, P=0.048)、sRAGE、 BUN (r=0.160, P=0.038), sRAGE、 eGFR (r=-0.185, P=0.016), 1。

2.3 与 基线资料

冠心病患者 肾功能不同 肾功能 (109 肾功能下 (61) 肾功能 ,肾功能下 年龄 高,体、高、 、 血、 ,年龄 > 55 岁 高, 性 学 (P < 0.05), 2。

表1 入组患者基本资料

Tab.1 Characteristics of the patients at baseline

[n(%), M(P<sub>25</sub>, P<sub>75</sub>),  $\bar{x} \pm s$ ]

Characteristic	CHD (n = 170)
Sex	
Male	121 (71.2)
Female	49 (28.8)
Age/a	62.00 (56.00, 72.25)
Weight/kg	70.00 (64.00, 77.00)
Height/cm	168.00 (160.25, 172.00)
BMI/(kg · m <sup>-2</sup> )	25.43 ± 3.22
SYNTAX score	10.00 (6.50, 15.00)
Clinical history	
Hypertension	118 (69.4)
Diabetes	82 (48.2)
Never smoked	62 (36.5)
Hyperlipidemia	153 (90.0)
Diagnosis	
Angina pectoris	110 (64.7)
Acute myocardial infarction	60 (35.3)
Vital signs	
Systolic BP/mmHg <sup>△</sup>	129.02 ± 21.74
Diastolic BP/mmHg <sup>△</sup>	75.00 (66.00, 81.00)
Heart rate/min <sup>-1</sup>	71.00 (64.00, 80.00)
Laboratory parameters	
Hemoglobin/(g · L <sup>-1</sup> )	139.89 ± 17.40
Total protein/(g · L <sup>-1</sup> )	64.05 ± 4.64
Albumin/(g · L <sup>-1</sup> )	40.08 ± 2.83
Glucose/(mmol/L)	5.00 (4.40, 6.41)
HbA1c/%	6.10 (5.60, 7.10)
SCr/(μ	

表 2 肾功能正常组及肾功能下降组患者临床特征比较

Tab. 2 Clinical characteristics of CHD patients with normal or decreased renal function at baseline [n(%), M(P<sub>25</sub>, P<sub>75</sub>),  $\bar{x} \pm s$ ]

Characteristic	Normal renal function (n = 109)	Decreased renal function (n = 61)	Statistics (t, $\chi^2$ )	P
Sex				
Male	84 (76.1)	37 (60.7)	5.133	0.023
Age/a	58.00 (53.00, 63.50)	70.00 (65.00, 73.50)	-7.921	<0.001
>55	72 (66.7)	57 (93.4)	16.030	<0.001
Weight/kg	70.00 (65.00, 80.00)	68.00 (60.00, 75.00)	-2.425	0.015
Height/cm	170.00 (163.00, 173.00)	164.50 (156.00, 170.00)	-3.507	<0.001
BMI/(kg · m <sup>-2</sup> )				

表3

Characteristic	$\beta$	$\chi^2$	Wald	OR	95% CI	P
Positive	0.161	0.320	0.254	1.175	0.628 – 2.201	0.614
Negative				1	Reference	
Smoking history						
Positive	0.518	0.329	2.474	1.679	0.880 – 3.202	0.116
Negative				1	Reference	
Hyperlipidemia						
Positive	-0.249	0.521	0.229	0.779	0.281 – 2.164	0.632
Negative				1	Reference	
Diagnosis						
Angina pectoris	0.287	0.340	0.714	1.333	0.685 – 2.595	0.398
Acute myocardial infarction				1	Reference	
Vital signs						
Systolic BP	0.012	0.008	2.698	1.012	0.998 – 1.028	0.100
Diastolic BP	-0.033	0.013	6.002	0.968	0.942 – 0.993	0.014
Heart rate	-0.021	0.015	2.039	0.979	0.952 – 1.008	0.153
Laboratory parameters						
Hemoglobin	-0.055	0.012	21.470	0.946	0.925 – 0.969	<0.001
Total protein	-0.014	0.035	0.151	0.987	0.921 – 1.056	0.698
Albumin	-0.147	0.061	5.849	0.863	0.766 – 0.973	0.016
Glucose	-0.076	0.076	1.011	0.927	0.799 – 1.075	0.315
HbA1c	0.000	0.118	0.000	1.000	0.793 – 1.261	0.999
SCr	0.119	0.019	37.418	1.126	1.084 – 1.170	<0.001
BUN	0.510	0.120	18.125	1.665	1.317 – 2.105	<0.001
eGFR	-19.076	431.759	0.002	0.000	0.000	0.965
Urine red blood cells						
Positive	0.717	0.366	3.826	2.048	0.999 – 4.199	0.050
Negative				1	Reference	
Urine white blood cells						
Positive	0.372	0.388	0.918	1.450	0.678 – 3.101	0.338
Negative				1	Reference	
Urine protein						
Positive	-0.128	0.528	0.059	0.880	0.312 – 2.477	0.808
Negative				1	Reference	
Urine glucose						
Positive	-0.664	0.499	1.771	0.515	0.193 – 1.369	0.183
Negative				1	Reference	
sRAGE	0.843	0.291	8.404	2.323	1.314 – 4.107	0.004

**CHD**: coronary atherosclerotic heart disease; **BMI**: body mass index; **SYNTAX**: Synergy between Percutaneous Coronary Intervention with TAXUS and Cardiac Surgery; **BP**: blood pressure; **HbA1c**: glycosylated hemoglobin A1c; **SCr**: serum creatinine; **BUN**: blood urea nitrogen; **eGFR**: estimated glomerular filtration rate; **sRAGE**: soluble receptor for advanced glycation end products.

4 冠心病患者肾功能的 Logistic 分析  
**Tab. 4 Multivariate Logistic regression analysis of CHD patients with decreased renal function**

Characteristic	$\beta$	$\chi^2$	Wald	OR	95% CI	P
Constant	-9.585	6.922	1.917	-	-	0.166
sRAGE	1.083	0.538	4.058	2.954	1.030 – 8.474	0.044
SCr	0.265	0.048	29.832	1.303	1.185 – 1.433	<0.001
Sex						
Male	-4.525	1.153	15.411	0.011	0.001 – 0.104	<0.001
Female				1	Reference	
Age/a						
>55	2.508	1.069	5.504	12.279	1.511 – 99.793	0.019
≤55				1	Reference	
Hemoglobin	-0.033	0.023	2.048	0.967	0.924 – 1.012	0.152
Albumin	-0.142	0.140	1.028	0.867	0.659 – 1.142	0.311

**CHD**: coronary atherosclerotic heart disease; **sRAGE**: soluble receptor for advanced glycation end products; **SCr**: serum creatinine.

