

[doi: 10.3969/j.issn.1006-7795.2022.02.001]

· 心血管病学基础与临床研究 ·

陈璐¹ 郭新颖¹ 刘建¹ 杜凤和² 郭彩^{1*}

(1.首都医科大学附属北京同仁医院心血管中心,北京 100730;2.首都医科大学附属北京天坛医院老年科,北京 100070)

【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 ± 0.61) $\mu\text{g/L}$ vs (1.70 ± 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

【中图分类号】 R541.4 **【文献标识码】** A

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

Chen Lu¹, Guo Xinying¹, Liu Jian¹, Du Fenghe², Guo Caixia^{1*}

(1. Cardiovascular Center, Beijing Tongren Hospital, Capital Medical University, Beijing 100730, China; 2. Department of Geriatrics, Beijing Tiantan Hospital, Capital Medical University, Beijing 100070, China)

【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 ± 0.61) $\mu\text{g/L}$ vs (1.70 ± 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^[1],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

基金项目:国家自然科学基金(82171080,81870265),中国中青年临床研究基金(2017-CCA-VG-045)。This study was supported by National Natural Science Foundation of China (82171080, 81870265), China Young and Middle-aged Clinical Research Fund (2017-CCA-VG-045)。

* Corresponding author, E-mail: cxgbb@163.com

网络出版时间:2022-04-01 16:18 网络出版地址:https://kns.cnki.net/kcms/detail/11.3662.R.20220401.1504.018.html

、 、 [2]。 [3-4] (soluble receptor for advanced glycation end products, sRAGE) sRAGE sRAGE

1 对象与方法

1.1 研究对象

2018 5 12 170 (estimated glomerular filtration rate, eGFR), eGFR <90 mL · min⁻¹ · 1.73 m⁻² (), eGFR ≥90 mL · min⁻¹ · 1.73 m⁻² () [5]。 :①拟 接 术;② 龄 ≥18 岁。排除 :①严重 肝、 不全;②急、慢 感染 ;③恶 肿瘤; ④ 流 力 严重瓣膜 ;⑤ 随骨髓 或凝 。 定 少存 1 支主要 或 支 ≥50%。

定 《急 ST (2019)》[6] 《 ST 急 (2016)》[7]。 (:KY 2018-101-02),

1.2 基线资料收集

龄、 、 (body mass index, BMI), 、 、 (serum creatinine, SCr)、 (blood urea nitrogen, BUN)、 、 (glyco-sylated hemoglobin A1c, HbA1c)、 、 、 eGFR 慢 流 (Chronic Kidney Disease Epidemiology Collaboration, CKD - EPI) 。

1.3 临床检测

(1) sRAGE 定:

2 mL 凝 , 3 000 r/min 10 min, -80 °C 存 (enzyme linked immunosorbent assay, ELISA) sRAGE ,sRAGE ELISA Aviscera Bioscience 。 (2) Judkin's , 、 2 2 不 3 。 (3) 严重 : SYNTAX , http://www.syntaxscore.com SYNTAX 严重。 [8]。

1.4 统计学方法

SPSS 25.0 Kolmogorov-Smirnov test ± (x̄ ± s) , t ; “ ()” [M(P₂₅, P₇₅)] , Mann-Whitney U 。 “ ()” , χ² 或 Fisher 。 Spearman Logistic 。 P < 0.05 。

2 结果

2.1 基线资料

170 。 、 、 、 、 、 1。

2.2 sRAGE 与 的 关 分

sRAGE SCr、 BUN、eGFR ,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

不 (109) (61)。 龄 , 、 、 、 、 龄 >55 岁 , (P < 0.05), 2。

表 1 入组患者基本资料

Tab. 1 Characteristics of the patients at baseline

[n(%), M(P₂₅, P₇₅), $\bar{x} \pm s$]

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 ⁻²)	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 ^Δ	129.02 ± 21.74
Diastolic BP/mmHg ^Δ	75.00 (66.00, 81.00)
Heart rate/min ⁻¹	71.00 (64.00, 80.00)
Laboratory parameters	
Hemoglobin/(g · L ⁻¹)	139.89 ± 17.40
Total protein/(g · L ⁻¹)	64.05 ± 4.64
Albumin/(g · L ⁻¹)	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(P₂₅, P₇₅), $\bar{x} \pm s$]

Characteristic	Normal renal function (n = 109)	Decreased renal function (n = 61)	Statistics(<i>t</i> , <i>z</i> , χ^2)	<i>P</i>
Sex				
Male	84(77.1)	37(60.7)	5.133	0.023
Age/a	58.00(53.00, 63.50)	74.00(65.00, 78.50)	-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 ⁻²),				



表3

Characteristic	β	P	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

Tab. 4 Multivariate Logistic regression analysis of CHD patients with decreased renal function

Characteristic	β	P	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.

[1,2-4,9] 期 期
 , sRAGE sRAGE
 , 基 sRAGE
 , sRAGE
 [10]。然 , sRAGE
 。 Katagiri [11] 报 ,
 5 期 sRAGE
 1 2 期 ($P < 0.01$) 3 4 期 ($P < 0.05$)
 eGFR ($r = -0.490, P = 0.007$) [4]
 ($r = 0.484, P = 0.006$)
 sRAGE
 sRAGE
 。
 sRAGE
 , sRAGE
 ± 0.61) $\mu\text{g} \cdot \text{L}^{-1}$ vs (1.70 ± 0.60) $\mu\text{g} \cdot \text{L}^{-1}$, $P < 0.01$]
 Logistic sRAGE
 (OR = 2.954, 95%
 CI: 1.030 ~ 8.474, $P < 0.05$)。 [3] , sRAGE
 期 , sRAGE
 5 年
 [4]。 ,
 sRAGE
 eGFR、SCr 年 ,
 然 年、SCr
 sRAGE , 然
 sRAGE , 年
 sRAGE 大
 sRAGE ,
 sRAGE 期
 。
 , sRAGE
 sRAGE
 sRAGE
 sRAGE
 sRAGE
 sRAGE
 sRAGE

参考文献

报 2020 [J]. 中国 , 2021, 36
 (6): 521 – 545.

[2] Kumar J P, Ete T, Malviya A, et al. Microalbuminuria: correlation with prevalence and severity of coronary artery disease in non-diabetics [J]. J Clin Med Res, 2017, 9 (10): 838 – 843.

[3] Rebholz C M, Astor B C, Grams M E, et al. Association of plasma levels of soluble receptor for advanced glycation end products and risk of kidney disease: the atherosclerosis risk in communities study [J]. Nephrol Dial Transplant, 2015, 30(1): 77 – 83.

[4] Thomas M C, Woodward M, Neal B, et al. Relationship between levels of advanced glycation end products and their soluble receptor and adverse outcomes in adults with type 2 diabetes [J]. Diabetes Care, 2015, 38(10): 1891 – 1897.

[5] 范 范 家
 筛 [J]. 中国
 科 , 2017, 37(1): 28 – 34.

[6] 中华医学
 辑 . ST
 (2019) [J]. 中华 , 2019, 47(10): 766 – 783.

[7] 中华医学
 辑
 ST
 (2016) [J]. 中华 , 2017, 45 (5): 359 – 376.

[8] Neumann F J, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS guidelines on myocardial revascularization [J]. Eur Heart J, 2019, 40(2): 87 – 165.

[9] Taskiran M, Iversen A, Klausen K, et al. The association of microalbuminuria with mortality in patients with acute myocardial infarction. A ten-year follow-up study [J]. Heart Int, 2010, 5(1): e2.

[10] Wang X M, Xu T T, Mungun D, et al. The relationship between plasma soluble receptor for advanced glycation end products and coronary artery disease [J]. Dis Markers, 2019, 2019: 4528382.

[11] Katagiri M, Shoji J, Kato S, et al. Relationships between vitreous levels of soluble receptor for advanced glycation end products (sRAGE) and renal function in patients with diabetic retinopathy [J]. Int Ophthalmol, 2017, 37(6): 1247 – 1255.

(收稿日期:2021-12-23)

编辑 慕 萌

[1] 中国 报 . 中国