

doi: 10.3978/j.issn.2095-6959.2020.09.010

View this article at: <http://dx.doi.org/10.3978/j.issn.2095-6959.2020.09.010>

2型糖尿病合并冠心病患者的红细胞分布宽度的临床价值

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[摘要] 目的: 研究2型糖尿病合并冠心病患者红细胞分布宽度(red cell distribution width, RDW)的临床价值。方法: 选择2015年12月到2017年12月到临高县人民医院就诊的2型糖尿病患者200例, 根据是否合并冠心病分为合并组126例, 未合并组74例, 另选同期体检健康者200名为对照组。所有受试者检测红细胞相关参数红细胞压积(hematocrit, HCT)、平均红细胞体积(mean corpuscular volume, MCV)、RDW以及三酰甘油(triglyceride, TG)、总胆固醇(total cholesterol, TC)、高密度脂蛋白胆固醇(high-density lipoprotein cholesterol, HDL-C)、低密度脂蛋白胆固醇(low-density lipoprotein cholesterol, LDL-C)、空腹血糖(fasting blood glucose, FBG), 合并组患者检测颈总动脉的内-中膜厚度(intima-media thickness, IMT)、颈动脉斑块Crouse积分、Gensini评分。统计对照组及糖尿病组患者相关实验室参数水平, 统计合并组及未合并组患者相关实验室参数水平, 统计不同IMT、Crouse积分、Gensini评分合并组患者的红细胞相关参数, 分析合并组的红细胞相关参数与LDL-C, FBS, IMT, Crouse积分、Gensini评分的相关性及红细胞相关参数对糖尿病合并冠心病的预测价值。结果: 糖尿病组HCT, MCV, RDW, TC, TG, LDL-C, FBS水平均高于对照组, HDL-C水平低于对照组($P < 0.05$); 合并组HCT, MCV, RDW, LDL-C, FBS水平均高于未合并组($P < 0.05$); Pearson相关性分析显示糖尿病合并冠心病患者HCT, MCV, RDW水平与LDL-C, FBS水平呈显著正相关关系($P < 0.05$); 合并组IMT, Crouse积分, Gensini评分越高则HCT, MCV, RDW水平越高($P < 0.05$); Pearson相关性分析显示糖尿病合并冠心病患者Gensini评分, IMT, Crouse积分与MCV, RDW呈显著正相关($P < 0.05$); 受试者工作特征(receiver operating characteristic, ROC)曲线分析显示MCV, RDW联合检测曲线下面积(area under the curve, AUC)大于各指标单独检测($P < 0.05$)。结论: 糖尿病合并冠心病患者MCV, RDW水平显著上升, 联合上述指标可进一步提高对糖尿病合并冠心病的预测价值。

[关键词] 2型糖尿病; 红细胞分布宽度; 平均红细胞体积; 红细胞压积

Clinical value of red cell distribution width in patients with type 2 diabetes mellitus and coronary heart disease

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Abstract **Objective:** To study the clinical value of red cell distribution width (RDW) in patients with type 2 diabetes

收稿日期 (Date of reception): 2020-05-06

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mellitus (T2DM) and coronary heart disease (CHD). **Methods:** A total of 200 T2DM patients who were treated in the Lingao People's Hospital during the period from December 2015 to December 2017 were enrolled. According to presence or absence of CHD, they were divided into combination group (126 cases) and non-combination group (74 cases). Another 200 healthy people who underwent physical examination in the same period were enrolled as control group. Red cell related parameters of all people were detected, including hematocrit (HCT), mean corpuscular volume (MCV), RDW, triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and fasting blood glucose (FBG). Intima-media thickness (IMT) of common arteries, Crouse score and Gensini score of carotid plaques in combination group were detected. The levels of related laboratory parameters in control group and T2DM group were statistically analyzed. The levels of related laboratory parameters in combination group and non-combination group were statistically analyzed. The erythrocyte-related parameters of patients with different IMT, Crouse and Gensini scores in combination group were statistically analyzed. The correlation between erythrocyte-related parameters and LDL-C, FBS, IMT, Crouse score, Gensini score, and the predictive value of erythrocyte-related parameters for T2DM combined with CHD in combination group were analyzed. **Results:** The levels of HCT, MCV, RDW, TC, TG, LDL-C and FBS in T2DM group were higher than those in control group ($P<0.05$), while level of HDL-C was lower than that in control group ($P<0.05$). The levels of HCT, MCV, RDW, LDL-C and FBS in combination group were higher than those in non-combination group ($P<0.05$). Person correlation analysis showed that levels of HCT, MCV and RDW were significantly positively correlated with the levels of LDL-C and FBS in patients with T2DM and CHD ($P<0.05$). The higher the ICT, Crouse score and Gensini score, the higher the levels of HCT, MCV and RDW in combination group ($P<0.05$). Person correlation analysis showed that Gensini score, IMT and Crouse scores were significantly positively correlated with MCV and RDW in patients with T2DM and CHD ($P<0.05$). The receiver operating characteristic (ROC) curves showed that the area under the ROC curve (AUC) of MCV combined with RDW was greater than that of single index ($P<0.05$). **Conclusion:** The levels of MCV and RDW are significantly increased in patients with T2DM and CHD. The combination of the above indexes can further improve the predictive value for T2DM combined with CHD.

Keywords type 2 diabetes mellitus; red cell distribution width; mean corpuscular volume; hematocrit

糖尿病已成为21世纪最流行的疾病之一, 据文献[1]报道上个10年中糖尿病发病率超过50%, 全球均有发病, 多见于发达国家。但最新研究^[2]指出近年来亚洲、非洲等地糖尿病发病率增长幅度显著上升, 直至2030年将增加50%糖尿病患者。糖尿病可分为1型、2型及妊娠糖尿病, 临床特征为高血糖。2型糖尿病是糖尿病主要类型, 在糖尿病患者中占比约85%, 表现为外周胰岛素抵抗及胰岛素代偿性分泌过多。大量研究^[3-5]已证实糖尿病将引起多种并发症, 其中血管并发症将最终引起患者残疾甚至死亡。糖尿病引起的血管并发症可分为微血管疾病及大血管疾病, 其中微血管疾病包括视网膜病变及糖尿病肾病, 而大血管疾病有脑血管病变、心血管疾病及外周血管疾病等。红细胞分布宽度(red blood cell distribution width, RDW)反映红细胞体积变异系数, 其与糖尿病患者病情存在一定联系。基于此, 本研究分析糖尿病

患者RDW水平, 旨在探究其临床意义。

1 对象与方法

1.1 对象

选择2015年12月到2017年12月到临高县人民医院就诊的2型糖尿病患者200例为病例组, 根据是否合并冠心病分为合并组126例, 未合并组74例, 另选同期体检健康者200名为对照组。合并组男71例, 女55例; 年龄35~70(56.43 ± 5.64)岁; 病程1~16(8.49 ± 0.85)年; BMI为19~27(24.86 ± 0.55) kg/m^2 ; 糖化血红蛋白8%~13%($10.37\pm 1.04\%$)。未合并组男性39例, 女性35例; 病程1~16(8.32 ± 0.83)年; BMI为19~26(24.57 ± 0.52) kg/m^2 ; 糖化血红蛋白8%~12%($10.16\pm 1.01\%$)。2组一般资料差异无统计学意义($P>0.05$)。

纳入标准: 1)糖尿病诊断标准参照《中国2型

表2 合并组及未合并组红细胞相关参数、脂代谢相关指标以及血糖水平的比较

Table 2 Comparison on levels of red cells related parameters, lipid metabolism related indexes, and blood glucose between combination group and non-combination group

组别	<i>n</i>	HCT/%	MCV/fL	RDW/%	TC/ (mmol·L ⁻¹)	TG/ (mmol·L ⁻¹)	HDL-C/ (mmol·L ⁻¹)	LDL-C/ (mmol·L ⁻¹)	FBS/ (mmol·L ⁻¹)
合并组	126	45.87 ± 1.26	94.33 ± 3.67	15.09 ± 1.53	5.09 ± 1.03	1.63 ± 0.48	1.02 ± 0.32	1.83 ± 0.45	7.93 ± 2.15
未合并组	74	41.39 ± 1.15	86.91 ± 3.71	13.74 ± 1.35	4.85 ± 0.94	1.55 ± 0.36	0.94 ± 0.29	1.46 ± 0.49	6.82 ± 1.83
<i>t</i>		5.006	3.708	6.287	1.642	1.243	1.766	5.431	3.719
<i>P</i>		<0.001	<0.001	<0.001	0.102	0.216	0.079	<0.001	<0.001

表3 糖尿病合并冠心病患者红细胞相关参数水平与血糖以及脂代谢水平的关系

Table 3 Relationship between levels of red cells related parameters and blood glucose, lipid metabolism in patients with T2DM and CHD

指标	HCT/%		MCV/fL		RDW/%	
	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>
LDL-C	0.345	<0.001	0.352	<0.001	0.434	<0.001
FBS	0.215	<0.001	0.173	<0.001	0.316	<0.001

表4 不同IMT、Crouse积分、Gensini评分糖尿病合并冠心病患者的红细胞相关参数比较

Table 4 Comparison of red cells related parameters among T2DM-CHD patients with different IMT, Crouse and Gensini scores

冠心病指标	<i>n</i>	HCT/%	MCV/fL	RDW/%
Gensini评分				
<60	89	45.91 ± 1.59	95.08 ± 1.02	15.62 ± 1.56
≥60	37	46.11 ± 1.61	95.73 ± 1.08	17.83 ± 1.78
<i>t</i>		3.844	3.202	6.944
<i>P</i>		<0.001	0.002	<0.001
Crouse积分				
<12	81	45.56 ± 1.43	95.24 ± 1.28	15.38 ± 1.49
≥12	45	46.28 ± 1.52	96.20 ± 1.22	17.36 ± 1.62
<i>t</i>		2.648	4.101	6.927
<i>P</i>		0.009	<0.001	<0.001
IMT/mm				
<1.2	76	44.68 ± 1.87	95.17 ± 1.33	15.21 ± 1.52
≥1.2	50	45.93 ± 1.92	96.02 ± 1.45	17.24 ± 1.72
<i>t</i>		3.391	3.181	6.565
<i>P</i>		0.001	0.002	<0.001

2.5 糖尿病合并冠心病患者的红细胞相关参数与IMT、Crouse积分、Gensini评分的相关性

Pearson相关性分析显示：糖尿病合并冠心病患者的Gensini评分、IMT、Crouse积分与MCV、RDW水平呈正相关($P < 0.05$)，与HCT无明显相关

性($P > 0.05$ ，表5)。

2.6 红细胞相关参数对糖尿病合并冠心病的预测价值

MCV、RDW联合检测AUC值大于各指标单独检测，差异有统计学意义($P < 0.05$ ；表6，图1)。

表5 糖尿病合并冠心病患者的红细胞相关参数与IMT、Crouse积分、Gensini评分的相关性

Table 5 Correlation between red cells related parameters and IMT, Crouse, Gensini scores in patients with T2DM and CHD

指标	HCT		MCV		RDW	
	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>
Gensini评分	0.482	0.136	0.572	<0.001	0.583	<0.001
IMT	0.507	0.145	0.613	<0.001	0.605	<0.001
Crouse积分	0.461	0.128	0.597	<0.001	0.631	<0.001

表6 红细胞相关参数对糖尿病合并冠心病的预测价值

Table 6 Predictive value of red cells related parameters in T2DM combined with CHD

红细胞参数	AUC值	Cut-off点	敏感性/%	特异性/%	95%CI
MCV	0.826	96.02	66.67	85.06	0.748~0.888
RDW	0.842	16.95	56.41	95.40	0.766~0.901
联合检测	0.921	—	84.62	87.36	0.860~0.962

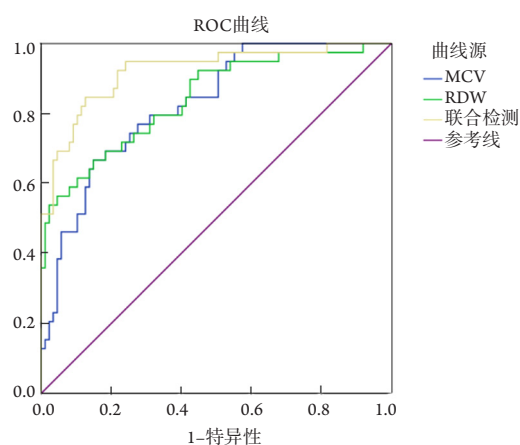


图1 红细胞相关参数预测糖尿病合并冠心病的ROC曲线

Figure 1 ROC curves of red cells related parameters predicting T2DM combined with CHD

3 讨论

糖尿病是多基因遗传及环境因素引起的胰岛素分泌缺陷或胰岛素应用障碍, 将导致糖脂代谢紊乱, 最终造成多系统、多脏器损害的内分泌代谢疾病, 临床主要表现为多饮、多食、多尿等。据文献[8-10]报道慢性高血糖将并发心、脑、肾等多器官病变, 其中2型糖尿病患者中约75%发生神经病变, 约30%发生视网膜病变, 约26%发生肾病变。目前, 出糖尿病并发症已成为仅次于肿瘤及心血管疾病的第3大危害人类健康的疾病, 不仅损害患者身心健康, 还影响患者预后, 给患者家庭、社会带

来负担^[11-13]。

血液流变是保持微循环顺畅的基础, 而血液流变学出现异常是促进糖尿病病情发展及发生并发症的主要因素。HCT指全血在离心沉淀后下沉红细胞在全血中的容积比, 目前研究^[14]已证实HCT可体现红细胞数量、大小、体积, 反映红细胞消长情况。2型糖尿病患者体内异常糖脂水平将影响血液流动性, 提升血液黏度并减慢血流速度, 使血液呈现高凝状态, 从而相应增加HCT水平。MCV反映红细胞体积的大小, 其水平增加与细胞内水钠潴留有关。当细胞内聚集大量钠离子时, 表面积与体积比值下降, 导致细胞膜变形能力降低, 增加MCV。MCV增加将增大在血管内通行阻力, 减缓血流速度; 另一方面需要更大的血液灌注压使其在血管中流通, 加大对血管壁压力, 增加血管壁厚度, 进一步阻滞血液流动, 促使并发症发生。研究^[15-16]指出: RDW越大, 红细胞大小一致性越差, 在长期高血糖影响下, 糖化血红蛋白水平升高, 降低红细胞膜内钠泵活力, 减弱红细胞变形能力, 增加异质性; 高葡萄糖还会与红细胞膜内脂蛋白作用, 从而改变脂蛋白组分, 降低细胞膜弹性及流动性, 进一步降低红细胞膜变形能力。

本研究中糖尿病组红细胞相关参数水平更高, 可能原因为长时间高血糖影响糖化红细胞膜蛋白, 降低流动性并破坏红细胞的可塑变形性, 导致红细胞形态异常, 增加RDW; 糖尿病患者红

细胞膜钠钾离子及钙离子酶活性受损, 增加细胞内钠离子、钙离子浓度, 使组织液进入细胞内引起水钠潴留, 增加MCV; 高血糖水平将减慢血流速度, 进而增加HCT水平。本研究中合并组红细胞相关参数水平更高, 可能原因为合并血管并发症后将促进血栓形成, 同时患者在渗透性利尿作用下还会不同程度失水, 进一步增加红细胞参数水平。刘俊艳等^[17]研究发现糖尿病合并血管病变患者RDW水平更高。

据文献[18-19]报道2型糖尿病患者多伴有一定的脂代谢异常, 本研究结果显示糖尿病患者TC, TG, LDL-C, FBS水平均高于对照组, HDL-C水平低于对照组, 进一步佐证了既往文献所述观点。而以LDL-C异常升高为主的脂代谢异常可造成血管内皮细胞功能损伤, 最终造成人体动脉内膜胆固醇聚集, 导致动脉硬化的发生。本研究结果显示: 合并组LDL-C, FBS水平均高于未合并组, 表明糖尿病合并冠心病的发生与血脂、血糖的异常密切相关。在本研究中, Pearson相关性分析显示糖尿病合并冠心病患者HCT, MCV, RDW水平与LDL-C, FBS水平呈正相关, 这与糖脂异常可通过各种机制影响血液流动性、细胞可塑变形性、细胞膜流动性有关, 而HCT, MCV, RDW水平升高将进一步加重冠状动脉粥样硬化程度, 导致糖脂异常。本研究结果提示2型糖尿病患者应在早期积极控制血糖、血脂, 以期控制动脉硬化的发生与发展。

本研究中合并组IMT、Crouse积分、Gensini评分越高则HCT, MCV, RDW水平越高, 且Pearson相关性分析显示糖尿病合并冠心病患者Gensini评分、IMT、Crouse积分与MCV, RDW水平呈显著正相关, 提示糖尿病合并冠心病患者红细胞参数水平能够反映冠状动脉粥样硬化严重程度, 与孙洁静等^[20]研究结果大体一致。本研究中ROC曲线显示MCV, RDW联合检测AUC值大于各指标单独检测, 表明联合MCV, RDW可进一步提高对糖尿病合并冠心病预测价值。

综上所述, 糖尿病合并冠心病患者血清HCT, MCV, RDW, LDL-C, FBS水平显著上升, HCT, MCV, RDW水平与LDL-C, FBS水平呈显著正相关关系, 且MCV, RDW水平与冠状动脉粥样硬化严重程度关系密切, MCV, RDW联合检测可进一步提高对糖尿病合并冠心病预测价值。本研究不足之处在于所选病例数较少, 后续将扩大样本量进一步研究。

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本文引用: 林维, 冯奇桃, 刁晓梁, 罗振华. 2型糖尿病合并冠心病患者的红细胞分布宽度的临床价值[J]. 临床与病理杂志, 2020, 40(9): 2281-2287. doi: 10.3978/j.issn.2095-6959.2020.09.010

Cite this article as: LIN Wei, FENG Qitao, DIAO Xiaoliang, LUO Zhenhua. Clinical value of red cell distribution width in patients with type 2 diabetes mellitus and coronary heart disease[J]. Journal of Clinical and Pathological Research, 2020, 40(9): 2281-2287. doi: 10.3978/j.issn.2095-6959.2020.09.010