

# 红细胞相关指标在胃癌早期诊断及预后评估中价值的研究

武建明, 李娟娟, 何婷, 古巧燕\*

延安大学附属医院消化内科, 陕西 延安

收稿日期: 2021年9月22日; 录用日期: 2021年10月15日; 发布日期: 2021年10月25日

---

## 摘要

胃癌(Gastric Cancer, GC)作为一种消化系统常见的恶性肿瘤, 由于许多患者早期没有有效判断疾病的明显临床症状及体征, 且胃镜检查有较差的检查体验感, 影响患者的接受程度, 以至于大多数胃癌患者在确诊时已处于癌症中晚期。随着临床医学的研究不断地深入探索, 有研究发现许多便捷的检测指标可以对胃癌的早期诊断以及预后评估起到一定的指导作用。本文就红细胞相关指标在胃癌的早期诊断及预后评估中的价值进行综述。

## 关键词

胃癌, 红细胞体积分布宽度, 血细胞比容, 平均红细胞体积

---

# Study on the Value of Red Blood Cell Related Indexes in the Early Diagnosis and Prognosis Evaluation of Gastric Cancer

Jianming Wu, Juanjuan Li, Ting He, Qiaoyan Gu\*

Department of Gastroenterology, Yan'an University Affiliated Hospital, Yan'an Shaanxi

Received: Sep. 22<sup>nd</sup>, 2021; accepted: Oct. 15<sup>th</sup>, 2021; published: Oct. 25<sup>th</sup>, 2021

---

## Abstract

Gastric cancer (GC) is a common malignant tumor of the digestive system. Because many patients fail to effectively judge the obvious clinical symptoms and signs of the disease in the early stage,

\*通讯作者。

文章引用: 武建明, 李娟娟, 何婷, 古巧燕. 红细胞相关指标在胃癌早期诊断及预后评估中价值的研究[J]. 临床医学进展, 2021, 11(10): 4738-4743. DOI: 10.12677/acm.2021.1110696

and the gastroscopy has a poor physical examination sense, it affects the acceptance of patients. As for most patients with gastric cancer at the time of diagnosis, they are already in the advanced stage of cancer. With the continuous in-depth exploration of clinical medicine research, studies have found that many convenient detection indicators can play a certain guiding role in the early diagnosis and prognosis evaluation of gastric cancer. This article reviews the value of red blood cell related indicators in the early diagnosis and prognostic evaluation of gastric cancer.

## Keywords

Gastric Cancer, Red Blood Cell Volume Distribution Width, Hematocrit, Average Red Blood Cell Volume

Copyright © 2021 by author(s) and Hans Publishers Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## 1. 引言

胃癌(GC)是指起源于胃黏膜上皮细胞的恶性肿瘤,绝大多数是腺癌。世界范围内胃癌在最常见恶性肿瘤中排名第五,病死率在所有恶性肿瘤中排名第3 [1]。以往报道了多种与胃癌相关的早期诊断及预后评估的方法,如放大胃镜、肿瘤 TNM 分期、组织分化、神经侵袭、消化道肿瘤生物标志物等[2] [3] [4] [5] [6],但由于各种检测费用昂贵及方式繁琐,在胃癌早期预测诊断和预后评估方面应用推广的范围存在一定局限性。既往报道,在早期胃癌及癌前病变患者中发现了红细胞体积的异常[7] [8],近些年的许多研究显示,血常规检测中红细胞相关指标的异常可以发挥对胃癌患者的早期诊断及预后评估的重要意义。本文就血常规中红细胞相关指标,红细胞分布宽度(RDW, Red blood cell volume distribution width)、红细胞压积(HCT, Hematocrit)、平均红细胞体积(MCV, Mean corpuscular volume)对胃癌的早期诊断及预后评估的临床价值进行综述。

## 2. 红细胞体积分布宽度(RDW, Red Blood Cell Volume Distribution Width)在胃癌早期诊断和预后评估中价值

红细胞体积分布宽度(RDW)是反应外周血红细胞体积异质性的参数,由血细胞分析仪测量而获得。其原理是红细胞通过仪器内计数小孔时,因细胞体积大小不同,得到一个相应大小脉冲,脉冲信号经计算机统计处理获得 RDW 值。临床上通常用于贫血的形态学分类和缺铁性贫血的诊断、鉴别诊断,缺铁性贫血患者在缺铁潜伏期时 RDW 即有增高,治疗后贫血已得到纠正, RDW 仍未将至正常水平,可能反应体内储存铁尚未完全补足,故 RDW 对缺铁性贫血治疗中的动态监测可能有一定价值。长期以来, RDW 主要用于贫血病因的诊断[9],然而越来越多的研究表明 RDW 是评估许多非血液疾病的重要指标[10] [11] [12] [13]。

2016 年 Pietrzyk 等[14]对波兰卢布林军事临床医院的 61 例胃癌患者和 61 例健康对照者的血液参数进行回顾性分析,两个研究组均除外高血压、糖尿病、抗血小板药物使用、肝肾功能衰竭、自身免疫性疾病的人群,使用国际癌症控制联盟的 TNM 癌症分期系统, TNM 1~2 期组 35 例, TNM 3~4 期组 26 例,结果显示, GC 组患者的 RDW 值较对照组明显升高,提示胃癌患者和健康人群 RDW 存在显著性差异。2017 年 Wei T [15]等对 144 例胃癌患者的回顾性分析显示, GC 患者的 RDW 值明显高于正常对照组,且 RDW 值与肿瘤分期及肿瘤标志物(癌胚抗原  $P < 0.01$ 、糖类抗原 19-9  $P < 0.05$ )呈显著正相关,提示 RDW

值可作为早期诊断及评估预后的标志物。此外,既往认为高 RDW 是由于血红蛋白降低所致,Wei T-T 等通过协方差分析表明,即使在血红蛋白恢复正常后,GC 患者的 RDW 仍显著升高,由此说明 GC 患者 RDW 升高不能完全由血红蛋白的降低来解释。2017 年 Cheng 等[16]通过分别对 227 例 GC 组和 164 例早期 GC 组的术前 RDW 与 101 例健康对照组的 RDW 比较,发现均较健康对照组显著升高,且 RDW 越高与高龄、肿瘤直径越大、肿瘤浸润深度越深、淋巴结转移越明显显著相关。研究显示,在 GC 组中,RDW 越高,总生存率越低,无病生存期越短;在早期 GC 组中,高 RDW 组的总生存率和无病生存期也明显低于低 RDW 组。此外,单因素和多因素生存分析显示,RDW 可作为影响无病生存期的独立预后因素,但对总生存期无显著影响。提示术前高 RDW 可以作为早期诊断及预后评估的指标。

2017 年 Yazici 等报道[17],对 172 例接受胃癌根治性手术患者的人口学资料、术前 RDW 水平、肿瘤特征等进行回顾性分析,依据术前 RDW 水平,将患者分为高 RDW 组( $n = 62$ )和低 RDW 组( $n = 110$ ),结果显示两组患者总死亡率和术后 60 天死亡率分别为 55%和 14%,高 RDW 与短期死亡率密切相关,且高 RDW 患者晚期癌症发生率较高,结果表明,术前高 RDW 提示患者会发生不良预后,可以作为一种预后评估的指标。2019 年 Hirahara 等[18]的研究同样证实这一观点,对 366 例根治性胃切除的胃腺癌患者术前 RDW 研究显示,RDW 与肿瘤大小、浸润深度、淋巴结转移、病理分期、血清白蛋白浓度和 C 反应蛋白呈正相关,术前高 RDW 反映了由更具侵袭性或进展性的癌症引起的肿瘤相关的全身炎症和营养不良。高 RDW 与总生存率差有显著的关联。Cox 多因素分析显示,术前 RDW 是胃癌根治性切除术后的独立预后指标。

目前许多学者已认同术前高 RDW 对 GC 患者具有早期诊断及预后评估作用。然而,Shota 等[19]报道术后 RDW 同样可作为 GC 患者预后的一项指标,根据 5 年总体生存率的 ROC 分析确定术后最佳 RDW 值 14.05,并将术后患者分为高 RDW ( $\geq 14.05$ ,  $n = 117$ )、低 RDW ( $\leq 14.05$ ,  $n = 104$ )两组,结果显示,两组患者 5 年总体生存率有显著差异性( $P < 0.0001$ ),因此,术后 RDW 同样可作为判断胃癌预后的有价值的指标。

### 3. 血细胞比容(HCT, Hematocrit)在胃癌预后评估中的价值

血细胞比容(HCT)又称血细胞压积(packed cell volume, PCV),是指血细胞在血液中所占容积的比值。血细胞比容测定可反应红细胞的增多或减少,但受血浆容量改变的影响,同时也受红细胞体积大小的影响。血细胞比容增高见于各种原因所致的血液浓缩或各种原因所致红细胞绝对性增多;血细胞比容减低多见于各类贫血。

2019 年 Lin 等[20]的回顾性研究报道,对 2277 名接受根治性胃切除的胃癌患者术前 7 天内进行血清采集,患者中位年龄为 61 岁,血液检测指标包括血红蛋白(Hb)、血细胞比容(HCT)、淋巴细胞计数、白蛋白(Alb)和总胆固醇水平。在单因素分析中,术前 HCT、HB 与总生存期相关;然而,在对单个分期的单独分析中,只有 HCT 对所有肿瘤分期的预后具有显著影响。另外在多因素分析中,术前 HCT 仍是胃癌的独立预后因素。低 HCT 与高龄、体重指数低、肿瘤较大、淋巴结转移、晚期和血管受累显著相关。因此提示术前低 HCT 是胃癌根治术后一项新的、简便的预测指标,目前低 HCT 对 GC 患者不良预后的原因主要倾向于低 HCT 引起的细胞缺氧,以及由缺氧导致的肿瘤细胞对化疗药物敏感性降低所致[21] [22] [23] [24]。因此对于体重指数较低的老年 GC 患者,应注意术前 HCT 检测,加强营养,以改善患者预后。

最近的一项研究同样证实,术前 HCT 能够对胃癌术后预后进行评估。通过对 9936 例胃癌根治术患者资料的回顾性研究发现,术前 HCT  $< 29$  与术后脓毒症、30 天死亡率密切相关。此外,研究发现,术后输血可降低 HCT 发病风险[25]。

#### 4. 平均红细胞体积(MCV, Mean Corpuscular Volume)在胃癌预后评估中的价值

平均红细胞体积(MCV), 系指每个红细胞的平均体积, 其数值大小受红细胞发育及成熟的影响。以往认为, 高 MCV 参与了多种肿瘤的不良预后[26] [27] [28] [29]。

2019 年 Jomrich 等[30]对接受手术治疗的 314 名胃食管交界处腺癌的患者进行回顾性研究, 除外手术时有远处转移、切缘阳性、术后死于癌症以外的原因或术后 30 天内死亡、已知的酗酒史以及患有其他恶性肿瘤的患者, 术前 3 天内抽血进行全血细胞计数。结果显示, 中位总生存率(OS)为 36.8 个月, 中位无病生存期(DFS)为 20.6 个月; 多因素分析显示, 术前高 MCV 是总生存率和无病生存期的显著预后因素。同样在接受新辅助治疗的患者中发现, MCV 仍是总生存率和无病生存期的独立预后因素, 由此表明高 MCV 预示胃食管腺癌患者预后不良。因此在治疗胃食管腺癌患者时, 术前应纠正患者 MCV 的异常。

此外, 近期报道了一种新的预测 GC 患者预后的生物标志物(HRR), 将血红蛋白(HB)与红细胞分布宽度(RDW)之比作为预测 GC 患者在接受新辅助治疗后的预后指标, 高 HRR 预示患者总生存率和无病生存期较好[31]。

#### 5. 结论

以上研究从不同的人群中通过回顾性研究对红细胞体积分布宽度(RDW)、血细胞比容(HCT)、平均红细胞体积(MCV)指标在早期胃癌诊断及预后评估方面的价值进行了临床研究, 验证了红细胞相关指标在胃癌早期诊断和预后评估方面潜在的临床价值。因此, 在今后的临床中有必要给予更多的关注和从多个维度深入探索, 不断验证其临床价值。

#### 参考文献

- [1] Sung, H., Ferlay, J., Siegel, R., Laversanne, M., Soerjomataram, I., Jemal, A., *et al.* (2021) Global Cancer Statistics 2020: Globocan Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer Journal for Clinicians*, **71**, 209-249. <https://doi.org/10.3322/caac.21660>
- [2] Murakami, Y., Saito, H., Kono, Y., Shishido, Y., Kuroda, H., Matsunaga, T., *et al.* (2018) Combined Analysis of the Preoperative and Postoperative Prognostic Nutritional Index Offers a Precise Predictor of the Prognosis of Patients with Gastric Cancer. *Surgery Today*, **48**, 395-403. <https://doi.org/10.1007/s00595-017-1599-2>
- [3] Lin, J., Lin, J., Li, P., Xie, J.-W., Wang, J.-B., Lu, J., *et al.* (2018) Which Staging System Better Predicts 10-Year Survival for Gastric Cancer? A Study Using an International Multicenter Database. *European Journal of Surgical Oncology*, **44**, 1205-1211. <https://doi.org/10.1016/j.ejso.2018.05.014>
- [4] Zhao, X., Zou, J., Wang, Z., Li, G. and Lei, Y. (2021) Identifying Novel Cell Glycolysis-Related Gene Signature Predictive of Overall Survival in Gastric Cancer. *Biomed Research International*, **2021**, Article ID: 9656947. <https://doi.org/10.1155/2021/9656947>
- [5] Ran, T., Chen, Z., Zhao, L., Ran, W., Fan, J.Y., Hong, S.Y., *et al.* (2021) Lamb1 Is Related to the T Stage and Indicates Poor Prognosis in Gastric Cancer. *Technology in Cancer Research & Treatment*, **20**, Article ID: 2147483647. <https://doi.org/10.1177/15330338211004944>
- [6] Hu, Y., Chen, X., Hendi, M., Si, J., Chen, S. and Deng, Y. (2021) Diagnostic Ability of Magnifying Narrow-Band Imaging for the Extent of Early Gastric Cancer: A Systematic Review and Meta-Analysis. *Gastroenterology Research and Practice*, **2021**, Article ID: 5543556. <https://doi.org/10.1155/2021/5543556>
- [7] Bramberga, V. (1955) Modification of Erythrocytic Size in Precancerous and Cancerous Conditions of the Stomach. *Voprosy Kliniki I Lecheniia Zlokachestvennykh Novoobrazovanii*, **2**, 33-40.
- [8] Bramberga, V. (1956) Morphology of Erythrocytes and Erythropoiesis in Gastric Cancer and Precancer. *Voprosy Kliniki I Lecheniia Zlokachestvennykh Novoobrazovanii*, **4**, 27-105.
- [9] Salvagno, G., Sanchis-Gomar, F., Picanza, A. and Lippi, G. (2015) Red Blood Cell Distribution Width: A Simple Parameter with Multiple Clinical Applications. *Critical Reviews in Clinical Laboratory Sciences*, **52**, 86-105. <https://doi.org/10.3109/10408363.2014.992064>
- [10] Xu, W., Qiu, X., Ou, Q., Liu, C., Lin, J.-P., Chen, H.-J., *et al.* (2015) Red Blood Cell Distribution Width Levels Correlate with Liver Fibrosis and Inflammation: A Noninvasive Serum Marker Panel to Predict the Severity of Fibrosis and



- Inflammation in Patients with Hepatitis B. *Medicine*, **94**, e612. <https://doi.org/10.1097/MD.0000000000000612>
- [11] Li, W., Li, X., Wang, M., Ge, X., Li, F., Huang, B., *et al.* (2015) Association between Red Cell Distribution Width and the Risk of Heart Events in Patients with Coronary Artery Disease. *Experimental and Therapeutic Medicine*, **9**, 1508-1514. <https://doi.org/10.3892/etm.2015.2244>
- [12] Koma, Y., Onishi, A., Matsuoka, H., Oda, N., Yokota, N., Matsumoto, Y., *et al.* (2013) Increased Red Blood Cell Distribution Width Associates with Cancer Stage and Prognosis in Patients with Lung Cancer. *PLoS ONE*, **8**, Article ID: e80240. <https://doi.org/10.1371/journal.pone.0080240>
- [13] Lippi, G. and Plebani, M. (2014) Red Blood Cell Distribution Width (RDW) and Human Pathology. One Size Fits All. *Clinical Chemistry and Laboratory Medicine*, **52**, 1247-1249. <https://doi.org/10.1515/cclm-2014-0585>
- [14] Pietrzyk, L., Plewa, Z., Denisow-Pietrzyk, M., Zebrowski, R. and Torres, K. (2016) Diagnostic Power of Blood Parameters as Screening Markers in Gastric Cancer Patients. *Asian Pacific Journal of Cancer Prevention*, **17**, 4433-4437.
- [15] Wei, T., Wang, L., Yin, J., Liu, Y.-T., Qin, B.-D., Li, J.-Y., *et al.* (2017) Relationship between Red Blood Cell Distribution Width, Bilirubin, and Clinical Characteristics of Patients with Gastric Cancer. *International Journal of Laboratory Hematology*, **39**, 497-501. <https://doi.org/10.1111/ijlh.12675>
- [16] Cheng, S., Han, F., Wang, Y., Xu, Y., Qu, T., Ju, Y., *et al.* (2017) The Red Distribution Width and the Platelet Distribution Width as Prognostic Predictors in Gastric Cancer. *BMC Gastroenterology*, **17**, Article No. 163. <https://doi.org/10.1186/s12876-017-0685-7>
- [17] Yazici, P., Demir, U., Bozkurt, E., Isil, Gurhan, R. and Mihmanli, M. (2017) The Role of Red Cell Distribution Width in the Prognosis of Patients with Gastric Cancer. *Cancer Biomarkers*, **18**, 19-25. <https://doi.org/10.3233/CBM-160668>
- [18] Hirahara, N., Tajima, Y., Fujii, Y., Kaji, S., Yamamoto, T., Hyakudomi, R., *et al.* (2019) Comprehensive Analysis of Red Blood Cell Distribution Width as a Preoperative Prognostic Predictor in Gastric Cancer. *Anticancer Research*, **39**, 3121-3130. <https://doi.org/10.21873/anticancer.13448>
- [19] Shota, S., Saito, H., Kono, Y., Murakami, Y., Shishido, Y., Miyatani, K., *et al.* (2020) Prognostic Significance of Pre- and Post-Operative Red-Cell Distribution Width in Patients with Gastric Cancer. *Journal of Gastrointestinal Surgery*, **24**, 1010-1017. <https://doi.org/10.1007/s11605-019-04392-w>
- [20] Lin, J., Lin, J., Xie, J., Wang, J., Lu, J., Chen, Q.-Y., *et al.* (2019) Preoperative Hematocrit (hct) Is a Novel and Simple Predictive Marker for Gastric Cancer Patients Who Underwent Radical Gastrectomy. *Annals of Surgical Oncology*, **26**, 4027-4036. <https://doi.org/10.1245/s10434-019-07582-7>
- [21] Habler, O. and Messmer, K. (2000) Tissue Perfusion and Oxygenation with Blood Substitutes. *Advanced Drug Delivery Reviews*, **40**, 171-184. [https://doi.org/10.1016/S0169-409X\(99\)00048-4](https://doi.org/10.1016/S0169-409X(99)00048-4)
- [22] Harrison, L. and Blackwell, K. (2004) Hypoxia and Anemia: Factors in Decreased Sensitivity to Radiation Therapy and Chemotherapy? *The Oncologist*, **9**, 31-40. <https://doi.org/10.1634/theoncologist.9-90005-31>
- [23] Prosnitz, R., Yao, B., Farrell, C., Clough, R. and Brizel, D.M. (2005) Pretreatment Anemia Is Correlated with the Reduced Effectiveness of Radiation and Concurrent Chemotherapy in Advanced Head and Neck Cancer. *International Journal of Radiation Oncology, Biology, Physics*, **61**, 1087-1095. <https://doi.org/10.1016/j.ijrobp.2004.07.710>
- [24] Vaupel, P. (2004) The Role of Hypoxia-Induced Factors in Tumor Progression. *The Oncologist*, **9**, 10-17. <https://doi.org/10.1634/theoncologist.9-90005-10>
- [25] Kouyoumdjian, A., Trepanier, M., Al shehhi, R., Cools-Lartigue, J., Ferri, .E., Lee, L., *et al.* (2021) The Effect of Preoperative Anemia and Perioperative Transfusion on Surgical Outcomes after Gastrectomy for Gastric Cancer. *The Journal of Surgical Research*, **259**, 523-531. <https://doi.org/10.1016/j.jss.2020.10.003>
- [26] Yoshida, N., Kosumi, K., Tokunaga, R., Baba, Y., Nagai, Y., Miyamoto, Y., *et al.* (2020) Clinical Importance of Mean Corpuscular Volume as a Prognostic Marker after Esophagectomy for Esophageal Cancer: a Retrospective Study. *Annals of Surgery*, **271**, 494-501. <https://doi.org/10.1097/SLA.0000000000002971>
- [27] Li, K., Gu, W., Xia, X., Zhang, P., Zou, C. and Fei, Z. (2020) High Mean Corpuscular Volume as a Predictor of Poor Overall Survival in Patients with Esophageal Cancer Receiving Concurrent Chemoradiotherapy. *Cancer Management and Research*, **12**, 7467-7474. <https://doi.org/10.2147/CMAR.S230274>
- [28] Mizuno, H., Yuasa, N., Takeuchi, E., Miyake, H., Nagai, H., Yoshioka, Y., *et al.* (2019) Blood Cell Markers That Can Predict the Long-term Outcomes of Patients with Colorectal Cancer. *PLoS ONE*, **14**, Article ID: e0220579. <https://doi.org/10.1371/journal.pone.0220579>
- [29] 陆洛, 乔纯, 洪鸣, 李砚如, 潘良琴, 钱思轩, 朱雨, 李建勇. 平均红细胞体积可作为慢性髓系白血病疗效的预测指标[J]. 中国实验血液学杂志, 2018, 26(2): 382-388.
- [30] Jomrich, G., Hollenstein, M., John, M., Ristl, R., Paireder, M., Kristo, I., *et al.* (2019) High Mean Corpuscular Volume Predicts Poor Outcome for Patients with Gastroesophageal Adenocarcinoma. *Annals of Surgical Oncology*, **26**, 976-985. <https://doi.org/10.1245/s10434-019-07186-1>

- 
- [31] Yılmaz, A., Mirili, C., Tekin, S. and Bilici, M. (2020) The Ratio of Hemoglobin to Red Cell Distribution Width Predicts Survival in Patients with Gastric Cancer Treated by Neoadjuvant Flot: A Retrospective Study. *Irish Journal of Medical Science*, **189**, 91-102. <https://doi.org/10.1007/s11845-019-02153-x>