

Utility of the Red Blood Cell Distribution Width to Differentiate Colorectal Polyp

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Background: The red blood cell distribution width (RDW) may predict the prognosis of various cancers. The present study aimed to increase the stool occult blood test (SOBT) sensitivity to predict the results of colonoscopy by the correlation of RDW and polyp stages. Thus, RDW may be used to prioritize patients for colonoscopy.

Materials and Methods: The present study was a retrospective review of 1,311 asymptomatic patients who underwent the SOBT, complete blood count test (CBC), and a colonoscopy with follow-up biopsies if any abnormalities were found. Multinomial logistic regression was used to identify the association between RDW >13.95% and colonoscopy findings.

Results: The average RDW was 13.55±1.58. The results of colonoscopies diagnosed 15 colorectal cancers, 76 high-risk adenomas, 157 low-risk adenomas, 114 non-adenomatous polyps, 13 miscellaneous, and 936 normal. The RDW value was statistically higher in the low risk polyp group compared with the normal group. Higher stages of polyps improved the performance to predict the different types of polyp occurrences using the RDW.

Conclusion: RDW in low-risk adenoma patients was higher compared with the RDW value in the normal population. RDW values can be used to differentiate different types of polyps if there were more participants.

Keywords: Colorectal cancer, Red blood cell distribution width, Colorectal cancer screening, Colorectal polyp

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In 2018, 1.8 million people were diagnosed with colon cancer and 861,000 patients died from the disease. In Thailand, colon cancer has the fourth highest incidence and fifth highest cancer-related death rate⁽¹⁾.

The various tools of standard colon cancer screening facilitate detection of early stages and lead to effective treatments⁽²⁾. However, there are limitations such as low sensitivity, low specificity, costs, and invasiveness. Thus, a cost effective, non-invasive screening tool is desired for colon cancer screening.

Montagnana et al⁽³⁾ found a relationship between the red blood cell distribution width (RDW) and prediction of death and prognosis of various cancers. Yang et al⁽⁴⁾ examined 85 patients with colon cancer and found a significant difference in the RDW value at each stage of colon cancer, stage III+IV less than stage III, T3, T4 >T1+T2, N1+N2

>N0, and M1 >M0. Ay et al⁽⁵⁾ found that a patient with colon cancer had a significantly higher RDW value compared with colonic polyp patients. Song et al⁽⁶⁾ found that RDW in patients with colorectal cancer was significantly higher compared with that in the healthy group, whereas no difference in the RDW value was observed between colorectal cancer and adenoma patients.

On the basis of several studies, the RDW value may be used to predict the stage of colorectal cancer. This objective of this study was to examine the relationship between the RDW value and colorectal cancer and to determine whether RDW can be used to predict the types of polyps.

Materials and Methods

The present study was a retrospective review of data from the colon cancer screening project in Chulabhorn Hospital. The data were extracted from the electronic database from July 2009 to June 2010. Initially, there were 1,404 participants in the colon cancer screening project, but only 1,311 participants completed questionnaires and blood tests. The population in the present study was 1,311 Thai patients who did not have any previous history of cancer or any signs or symptoms of colorectal cancer such as a bowel habit change, lower gastrointestinal bleeding, decreased stool caliber, and anemia. After the participants signed the consent form and filed the questionnaire, they underwent a physical examination and blood tests to prepare for a colonoscopy. Four different colonoscopy results were used in accordance with the

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pathology, colorectal cancer, high-risk adenoma, low-risk adenoma, and non-adenomatous polyps. High-risk adenomas were described as a size greater than 1 cm or more than three adenomas, tubulovillous or villous adenoma, and high grade dysplasia. The Ethical Committee of Human Research of Chulabhorn Hospital approved this study (EC No. 017/2562).

Statistics

Demographic data were analyzed using descriptive statistics. Multinomial logistic regression was used to identify the association between RDW >13.95 and colonoscopy findings adjusted by sex, age, BMI, family history of CRC in first-degree relatives, drinking, smoking, and diabetes mellitus. The receiver operating characteristic curve (ROC) was used as an estimation of predictive performance. The analysis was conducted using Stata/SE version 12 software (StataCorp LP, College Station, TX, USA). Significance was defined as a two-sided p-value of less than 0.05.

Results

There were 1,311 participants in the present study (Table 1). The average RDW was 13.55 ± 1.58 . The results of

Table 1. Demographic data (n=1,311)

Variable	n	%
Sex		
Male	392	29.9
Female	919	70.1
Age	56.69 \pm 4.20	
50 to 55	551	42.0
56 to 59	394	30.1
60 to 65	366	27.9
BMI (kg/m ²)	25.05 \pm 4.01	
<25	706	53.8
\geq 25	605	46.2
Family history of CRC in first-degree relatives		
Present	115	8.8
Absent	1,196	91.2
Drinking		
Current or past drinking	483	36.8
Never	828	63.2
Smoking		
Current or past smoker	153	11.7
Never	1,158	88.3
Diabetes mellitus		
Yes	111	8.5
No	1,200	91.5
RDW	13.55 \pm 1.58	
Hemoglobin	13.12 \pm 1.34	

colonoscopy (Table 2) showed that 15 participants had colorectal cancer, 76 participants had high-risk adenoma, 157 participants had low-risk adenoma, 114 participants had non-adenomatous polyps, 13 participants were miscellaneous, and 936 participants had normal results. Using a cutoff RDW value of 13.95, the relationship between low risk polyps and a higher RDW value was statistically significant (Table 3). The cut-off value of RDW was obtained from the study of Yang et al⁽⁴⁾. However, in the other group of polyps, the RDW value was also higher, but it was not statistically significant. ROC analysis showed that the prediction of polyps using RDW would be more accurate in the late stages of polyps (Table 4).

Discussion

In the present study, the RDW of abnormal colonoscopic result group were higher than the normal group. A colonoscopy was performed in healthy participants who

Table 2. Colonoscopy results

Colonoscopy results	n	%
CRC	15	1.1
High risk	76	5.8
Low risk	157	12.0
Hyperplastic	114	8.7
Other	13	1.0
Normal	936	71.4

Table 3. Association between RDW <13.95 and colonoscopy findings

Colonoscopy findings	RRR (95% CI)	p-value
CRC	0.80 (0.26 to 2.41)	0.687
High risk	1.01 (0.60 to 1.72)	0.961
Low risk	1.55 (1.02 to 2.36)	0.040
Hyperplastic/other	1.50 (0.95 to 2.35)	0.081
Normal	Ref.	-

Adjusted by sex, age, BMI, family history of CRC in first-degree relatives, drinking, smoking, and diabetes mellitus

Table 4. Predictive performance of RDW >13.95

Colonoscopy findings	ROC area (95% CI)
Colorectal polyp	0.490 (0.456 to 0.525)
Colorectal adenoma/CRC	0.502 (0.462 to 0.541)
High-risk adenoma/CRC	0.540 (0.481 to 0.600)
CRC	0.548 (0.403 to 0.692)

did not have any symptoms, anemia or thalassemia to investigate the relationship between the stage of colorectal polyps and RDW values. The authors excluded anemic and thalassemic patients to avoid the confounder that affected RDW values. The results showed that the average RDW value was highest in patients with colon cancer, whereas the average RDW value of high risk patients was higher than that in low risk patients. Moreover, the RDW value of patients with hyperplastic polyps was the lowest compared with the other three groups, but still higher than that of the normal population.

Even though the RDW value was higher in the group with higher risk of colon cancer, it was statistically insignificant when compare colorectal cancer, high risk adenoma, hyperplastic polyp, group to normal group. Only the comparison between the RDW of low risk adenoma and normal group is statistically significant, which is contradicted by previous studies. The reason could be the participants in this study were asymptomatic. Therefore, the number of positive colonoscopic findings was insufficient. ROC analysis showed that the RDW value could be used to differentiate different types of polyps if the number of patients was large enough.

Conclusion

This study showed that the RDW value can be used to differentiate the different types of polyps if there were more participants in the study. Because RDW is a cost-effective, non-invasive, and easily accessible laboratory test, a colonoscopy may be unnecessary in some cases, which could be avoided if there were more extensive studies on the prediction of polyp types using RDW.

What is already known on this topic?

RDW is related the mortality of various cancers such as colon cancer. The RDW value is different in each stage of colon cancer and higher compared with that in the normal population.

What this study adds?

This study showed that the RDW value can be

used to differentiate the different types of colorectal polyps. Higher stages of polyps improve the performance of the prediction of the different types of polyp occurrences using RDW.

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Potential conflicts of interest

The authors declare no conflict of interest

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