Original Article

Use of Preoperative Complete Blood Count/Differential Count Values to Predict Prognosis in Patients with Colorectal Cancer

Yen-Lin Yu
Jung-Wei Fan
Wen-Ko Tseng
Chang Gung Memorial Hospital, Keelung Branch, CRS Department,Taiwan

Key Words
Colorectal cancer;
Absolute neutrophil count (ANC);
Absolute lymphocyte count (ALC);
Platelet count (PLT)

Purpose. Colorectal cancer has recently become the third leading cause of cancer-related death in Taiwan. The Department of Health, R.O.C. (Taiwan), recommends that all citizens aged between 50 and 69 years undergo the fecal occult blood test. Following the implementation of this policy, the number of asymptomatic colorectal cancer cases detected has increased. In the present study, we aimed to determine a simple and routine examination that could be used to evaluate the prognosis of patients with colorectal cancer.

Materials and Methods. Data were collected by reviewing patient records. From September 2006 to November 2008, 371 patients were diagnosed with colorectal cancer at Keelung Chang Gung Memorial Hospital, Taiwan. Of the 371 patients, 258 underwent tumor resection, and preoperative complete blood count/differential count (CBC/DC) data were available for 161 of these patients. Following resection of their tumors, the epidemiology, pathological findings, and follow-up information for each of these 161 patients were analyzed.

Results. Patients with colorectal cancer who indicated a preoperative increase in absolute neutrophil count (ANC > 5,650/mm^3), decrease in absolute lymphocyte count (ALC < 1,350/mm^3), and increase in platelet count (PLT > 360,000/mm^3) exhibited an increased recurrence rate and worse survival rate, after undergoing standard curative operations. Comparing to the pathological characteristic, the patients with colorectal cancer who had above preoperative lab data finding, also had high percentage of a larger tumor size (> 5 cm) and perineural invasion. Multivariate logistic regression analysis revealed that ANC values > 5,650/mm^3 (p = 0.005) and ALC values < 1,350/mm^3 (p = 0.041) are independent predictors of overall survival.

Conclusion. CBC/DC is a routine test used in preoperative evaluation that can be used to easily obtain ANC, ALC, and PLT values. In the present study, we have indicated the potential of these values to predict the prognosis in patients with colorectal cancer. The ease and cost-effectiveness associated with this test, compared to other methods, further enhance its potential for the evaluation of the prognosis in patients with colorectal cancer.

[*J Soc Colon Rectal Surgeon* (*Taiwan*) *2013;24:112-121*]

Received: April 30, 2013. Accepted: September 30, 2013.

Correspondence to: Dr. Wen-Ko Tseng, Chang Gung Memorial Hospital, Keelung Branch, CRS Department, No. 222, Maijin Road, Keelung 204, Taiwan. Tel: 0975-360-684; Fax: 02-2433-2655; E-mail: tomyuauk@msn.com

In recent decades, colorectal cancer has become the third leading cause of cancer-related death Taiwan. In the Taiwanese population, due to the policy on colorectal cancer screening implemented by the National Health Research Institute, colorectal cancer has become the most commonly detected cancer in recent years. However, despite the improvement of the chemotherapy/target therapy for colorectal cancer, approximately 1 in 4 cases with colorectal cancer are at an advanced disease stage, and We should find out this advance stage group and arrange further adjuvant chemotherapy/target therapy treatment.

The prognosis of colorectal cancer depends on several factors, such as clinical stage, presence of metastases, general condition of the patient, and tumor factors including degree of differentiation, invasion, and size. However, determination of these factors requires surgical resection of the primary lesion along with an expensive imaging study, such as a computerized tomography (CT) or positron emission tomography (PET). In the present study, we aimed to evaluate the usefulness of some routinely recorded laboratory values in predicting the prognosis of patients with colorectal cancer.

There have been several reports in the literature suggesting the use of routine blood sampling for the determination of neutrophil-to-lymphocyte ratio for the prediction of colorectal cancer prognosis.[1] In addition, some value in preoperative complete blood count, like absolute lymphocyte count (ALC), absolute neutrophil count (ANC), and platelet count (PLT) have been shown to correlate with progression in a variety of cancers, such as leukemia, as well as gastric, renal, and pancreatic cancer. According to above researches, we hypothesized that maybe we can find out some interesting result from the routine preoperative complete blood count in the patients with colorectal cancer.

Materials and Methods

From June 2006 to November 2008, 371 colorectal cancer patients were diagnosed at the Keelung Branch of Chang Gung Memorial Hospital in Taiwan. Of these patients, 258 received standard curative operations, including primary tumor resection and mesocolon resection, which were performed by 2 board-certified colorectal surgeons of the hospital. The following patients were excluded from the study: 71 patients without complete preoperative CBC/DC data; 2 patients who died of other causes 48 hours after their operation; 4 patients who were lost to follow-up; and 2 patients who did not undergo the operation immediately after diagnosis. The remaining 161 patients were enrolled in the study. We reviewed and analyzed the: preoperative laboratory data; pathological findings; results of continuous follow-up for at least 3 years postoperatively; gender; age at diagnosis; location of tumor; pathological stage; tumor size; number of lymph node involvement; lymphovascular invasion; perineural invasion; lymphocyte infiltration; pathological differentiation; carcinoembryonic antigen (CEA) level; and preoperative corrected CBC/DC data for each patients. Analysis was performed by the Statistical Package for the Social Sciences version 20 (SPSS Inc. Chicago, USA).

We determined the optimal cut-off values of the ANC that might influence the overall survival rate. The ANC range (10^{th} percentile to 90^{th} percentile) was 2,316-12,454/mm^3. The potential cut-off points analyzed were intervals of 2,000/mm^3 from 2,000/mm^3 to 12,000/mm^3. We used the minimum p-value and the maximum hazard ratio to determine the optimal cut-off value, which was eventually estimated as 5,650/mm^3 ($p < 0.001$; hazard ratio, 4.069; 95% CI, 1.940-8.535; Table 1). Using the same method, we also determined the optimal cut-off values of ALC and PLT that might influence the overall survival rate. The optimal cut-off value for ALC was 1,350/mm^3 ($p = 0.008$; hazard ratio, 2.61; 95% CI, 1.271-5.360; Table 2), and that for PLT was 360,000/mm^3 ($p = 0.024$; hazard ratio, 2.465; 95% CI, 1.111-5.471; Table 3).

After determining the optimal cut-off values of ANC (5,650/mm^3), ALC (1,350/mm^3), and PLT (360,000/mm^3), we performed univariate analysis using the chi-square test to analyze the differences between the individuals with values that were higher and lower than the optimal cut-off values. These analyses included several parameters, including epidemiology, pathological findings, recurrence rate, and

Table 1. Determination of the cut-off value for the absolute neutrophil count

Cut-value analysis for ANC		
Neutrophil count (/mm^3)	Uncorrected hazard ratio	Uncorrected *p* value
2000	0.427	0.586[a]
4000	1.788	0.103
5000	2.938	0.002
5500	3.715	< 0.001
5600	3.619	< 0.001
5650	4.069	< 0.001
5700	3.748	< 0.001
5800	3.450	0.001
5900	3.450	0.001
6000	3.671	< 0.001
8000	4.080	0.001
10000	2.944	0.056
12000	1.902	0.457[a]

Table 2. Determination of the cut-off value for the absolute lymphocyte count

Cut-value analysis for ALC		
Lymphocyte (/mm^3)	Uncorrected hazard ratio	Uncorrected *p* value
800	7.647	0.01[a]
1200	2.909	0.007
1300	2.451	0.015
1350	2.610	0.008
1400	2.481	0.012
1450	2.444	0.012
1500	2.129	0.032
1550	1.951	0.057
1600	1.869	0.071
2000	1.846	0.119
2400	0.941	0.908
2800	0.865	0.861
3200	1.098	1.000[a]

overall survival rate. Moreover, the Kaplan-Meier method was used to analyze the overall survival associated with ANC, ALC, and PLT. Finally, multivariate logistic regression analysis was performed to determine the epidemiological, pathological, and preoperative laboratory data factors that significantly affected the overall survival rate. The statistical significance in all cases was set at $p < 0.05$.

Table 3. Determination of the cut-off value for the platelet count

Cut-value analysis for platelet count		
PLT count (/mm^3)	Uncorrected hazard ratio	Uncorrected *p* value
150	0.411	0.165
200	0.639	0.266
250	1.005	0.988
300	1.900	0.077
350	2.159	0.051
360	2.465	0.024
370	2.400	0.032
380	2.167	0.063
390	2.335	0.043
400	2.412	0.050
450	1.477	0.512
500	4.889	0.070[a]

Result

The epidemiological characteristics of the 161 patients are displayed in Table 4. The patients included 82 men (50.9%) and 79 women (49.1%). The mean and median ages at diagnosis were 66.88 years and 69 years (range: 18-98 years), respectively. Among the patients, tumors were located in the colon in 103 patients (64.0%), in the rectum in 57 patients (35.4%), and in both the rectum and colon in 1 (0.6%) patient. With regard to pathological stage, 77 patients (47.7%) had early stage disease (stage 0, stage 1, and stage 2) and 83 patients (52.3%) had advanced stage disease (stage 3 and stage 4). The pathological characteristics of the 161 patients are shown in Table 5. We noted that 72 patients (44.7%) had tumors of diameter > 5 cm, 113 patients (70.2%) presented with lymphovascular invasion, and 81 patients (50.3%) presented with perineural invasion. Lymphocyte infiltration mild in 82 patients (50.9%), moderate in 53 patients (32.9%), marked in 12 patients (7.5%), and absent in 13 patients (8.1%). Tumors were poorly differentiated in 54 patients (34.3%), moderately differentiated in 88 pa-

Table 4. Characteristics of colorectal cancer patients

Epidemiology	
Category	No. (%)
Gender	
Male	82 (50.9)
Female	79 (49.1)
Age at diagnosis	years
Mean	66.88
Median	69 (18~98)
< 65 years	67 (41.6)
> 65 years	94 (56.4)
Tumor location	
Colon	103 (64.0)
Rectum	57 (35.4)
Combine	1 (0.6)
Pathological stage	
Stage 0	7 (4.3)
Stage 1	26 (16.1)
Stage 2	44 (27.3)
Stage 3	59 (36.6)
Stage 4	24 (14.9)

Table 5. Pathological findings

Pathology findings	
Category	No. (%)
Tumor size	
< 5 cm	88 (54.7)
> 5 cm	72 (44.7)
Lymphovascular invasion	
Absent	47 (29.2)
Present	113 (70.2)
Perineural invasion	
Absent	79 (49.1)
Present	81 (50.3)
Lymphocyte infiltration	
Absent	13 (8.1)
Mild	82 (50.9)
Moderate	53 (32.9)
Marked	12 (7.5)
Pathological differentiation	
Poor differentiated	54 (34.3)
Moderate differentiated	88 (56.0)
Well differentiated	15 (9.5)

PS: 1 pathological findings was lost follow up.

tients (56.0%), and well differentiated in 15 patients (9.5%).

Analysis of our data revealed some interesting phenomena. Patients with higher pretreatment ANC values (ANC > 5,650/mm^3) had higher rates of recurrence (48.8% vs. 24.6%, respectively; $p = 0.003$) and worse survival rates (46.5% vs. 78.0%, respectively; $p < 0.001$) after their standard curative operation, compared with those with lower pretreatment values (ANC < 5,650/mm^3). The pathological characteristics between these groups also differed. Among patients with ANC values > 5,650/mm^3, a higher proportion had tumors larger than 5 cm (75% vs. 25%, respectively; $p < 0.001$) and showed a greater degree of tumor perineural invasion (66.7% vs. 44.9%, respectively; $p = 0.015$), compared with those with ANC values < 5,650/mm^3. Similar findings were noted in patients with a lower pretreatment ALC value. The patients with ALC values < 1,350/mm^3 had a higher rate of recurrence (43.5% vs. 26.1%, respectively; $p = 0.031$) and worse survival rate (54.3% vs. 75.7%, respectively; $p = 0.008$), compared to those with ALC values > 1,350/mm^3. Analysis of the pathological characteristics of the ALC < 1,350/mm^3 group indicated that a higher proportion of these patients had tumors larger 5 cm (58.7% vs. 39.5%, $p = 0.027$) and showed increased tumor perineural invasion (65.2% vs. 44.7%, respectively; $p = 0.019$), compared with those with ALC values > 1,350/mm^3. When patients had high pretreatment PLT values, a reduced survival rate was noted (53.1% vs. 73.6%, respectively; $p = 0.024$), compared to those with low pretreatment PLT values. Among the patients with PLT values > 360,000/mm^3, a higher proportion of patients had tumors larger than 5 cm (75% vs. 37.5%, respectively; $p < 0.001$) and showed increased tumor perineural invasion (75% vs. 44.5%, respectively; $p = 0.002$), compared to those with PLT values < 360,000/mm^3 (Table 6).

The cumulative survival rates of these 3 different factors were individually analyzed by the Kaplan-Meier method. We revealed that patients with higher ANC values (ANC > 5,650/mm^3) had significantly worse survival rates (log-rank test, $p < 0.001$) (Fig. 1). Patients with decreasing ALC values (ALC

Table 6. Univariate analysis of the risk factors for recurrence rate, survival rate and pathological finding in colorectal cancer patients

Variable category	ANC < 5650 No. (%)	ANC > 5650 No. (%)	*p* value	ALC < 1350 No. (%)	ALC > 1350 No. (%)	*p* value	PLT < 360 No. (%)	PLT > 360 No. (%)	*p* value
Sex									
Male	61 (51.7)	21 (48.8)	0.748	22 (47.8)	60 (52.2)	0.618	71 (55.0)	11 (34.4)	0.036
Female	57 (48.3)	22 (51.2)		24 (52.2)	55 (47.8)		58 (45.0)	21 (65.6)	
Age									
< 65 years	48 (40.7)	19 (44.2)	0.689	14 (30.4)	53 (46.1)	0.069	47 (36.4)	20 (62.5)	0.007
> 65 years	70 (59.3)	24 (55.8)		32 (69.6)	62 (53.9)		82 (63.6)	12 (37.5)	
Tumor location									
Colon	74 (63.2)	29 (67.4)	0.623	26 (56.5)	77 (67.5)	0.188	80 (62.5)	23 (71.9)	0.322
Rectum	43 (36.8)	14 (32.6)		20 (43.5)	37 (32.5)		48 (37.5)	9 (28.1)	
Pathological stage									
Early stage (0, 1, 2)	62 (52.5)	15 (35.7)	0.061	17 (37.8)	60 (52.2)	0.101	65 (50.4)	12 (38.7)	0.243
Advance stage (3, 4)	56 (47.5)	27 (64.3)		28 (62.2)	55 (47.8)		64 (49.6)	19 (61.3)	
Recurrence									
No	89 (75.4)	22 (51.2)	0.003	26 (56.5)	85 (73.9)	0.031	93 (72.1)	18 (56.2)	0.083
Yes	29 (24.6)	21 (48.8)		20 (43.5)	30 (26.1)		36 (27.9)	14 (43.8)	
Survival									
No	26 (22.0)	23 (53.5)	< 0.001	21 (45.7)	28 (24.3)	0.008	34 (26.4)	15 (46.9)	0.024
Yes	92 (78.0)	20 (46.5)		25 (54.3)	87 (75.7)		95 (73.6)	17 (53.1)	
Tumor size									
< 5 cm	75 (63.6)	13 (31)	< 0.001	19 (41.3)	69 (60.5)	0.027	80 (62.5)	8 (25.0)	< 0.001
> 5 cm	43 (36.4)	29 (69)		27 (58.7)	45 (39.5)		48 (37.5)	24 (75.0)	
Lymphovascular invasion									
Absent	39 (33.1)	8 (19.0)	0.087	9 (19.6)	38 (33.3)	0.084	40 (31.2)	7 (21.9)	0.298
Present	79 (66.9)	34 (81.0)		37 (80.4)	76 (66.7)		88 (68.8)	25 (78.1)	
Perineural invasion									
Absent	65 (55.1)	14 (33.3)	0.015	16 (34.8)	63 (55.3)	0.019	71 (55.5)	8 (25.0)	0.002
Present	53 (44.9)	28 (66.7)		30 (65.2)	51 (44.7)		57 (44.5)	24 (75.0)	
Lymphocyte infiltration									
Absent, mild	69 (58.5)	26 (61.9)	0.697	28 (60.9)	67 (58.8)	0.807	76 (59.4)	19 (59.4)	1.000
Moderate, marked	49 (41.5)	16 (38.1)		18 (39.1)	47 (41.2)		52 (40.6)	13 (40.6)	

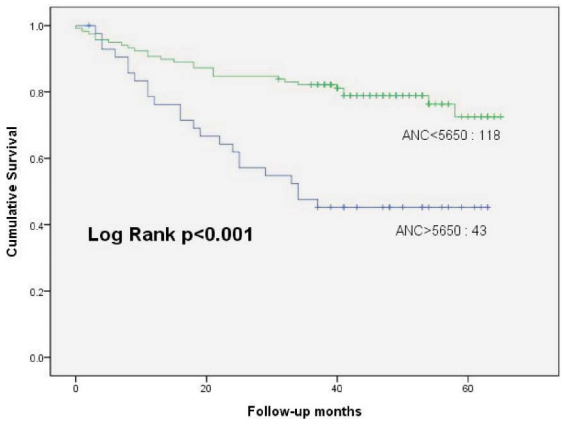

Fig. 1. Overall survival curves according to higher pretreatment ANC values and lower ANC values.

< 1,350/mm^3) and increasing PLT values (PLT > 360,000/mm^3) also had significantly worse survival rates (log-rank test, ALC < 1,350/mm^3, $p = 0.002$; PLT > 360,000/mm^3, $p = 0.022$) (Figs. 2 and 3).

We also analyzed these 3 parameters by multivariate logistic regression analysis and found that ANC value > 5,650/mm^3 and ALC value < 1,350/mm^3 are independent predictors of overall survival rate (Table 7).

The patients with colorectal cancer in the present study were divided into 4 groups based on the above-mentioned poor prognostic factors. The first group displayed none of the poor prognostic factors, the second group displayed 1 of the poor prognostic factors,

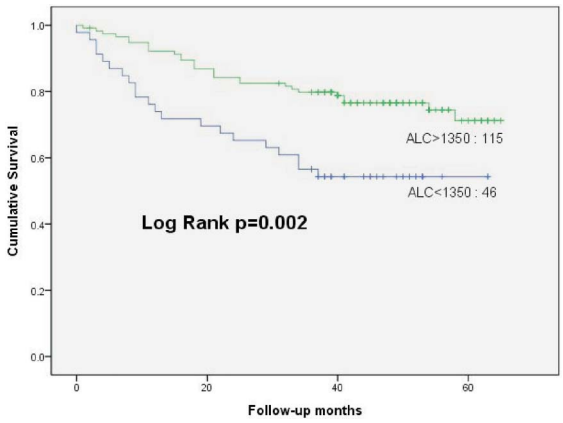

Fig. 2. Overall survival curves according to lower pretreatment ALC values and higher ALC values.

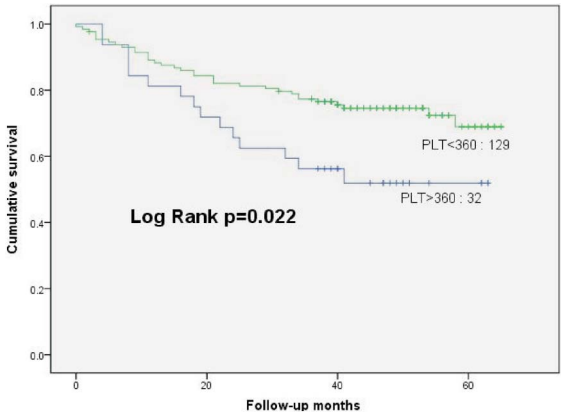

Fig. 3. Overall survival curves according to high pretreatment platelet values and lower platelet values.

Table 7. Multivariate logistic regression analysis of ANC, ALC and platelet

Poor prognostic factor	Hazard ratio	95% Cl	*p* value
ANC > 5650	3.097	1.413-6.789	0.005
ALC < 1350	2.225	1.032-4.798	0.041
PLT > 360	1.916	0.799-4.595	0.145

Multivariate logistic regression analysis.

the third group displayed 2 of the poor prognostic factors, and the fourth group showed all 3 poor prognostic factors. The cumulative survival of these 4 groups were analyzed by the Kaplan-Meier method, and significant differences between these 4 groups was also noted (Fig. 4).

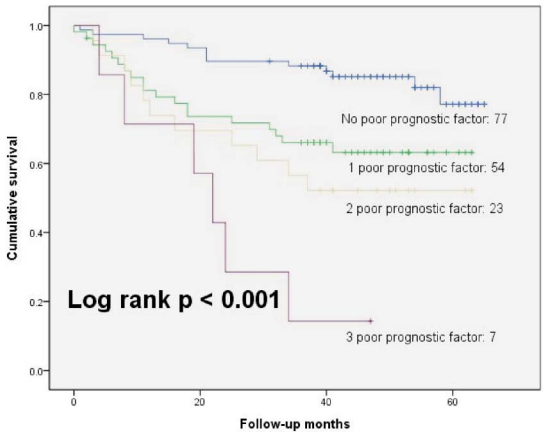

Fig. 4. Overall survival curves according to numbers of prognostic factor.

Discussion and Conclusion

In the last thirty years cancer has become the leading cause of death in Taiwan, and colorectal cancer is currently the third leading cause of cancer-related death. Since 2008, colorectal cancer has become the most prevalent cancer in Taiwan. At present, the Department of Health, R.O.C (Taiwan), has implemented a policy recommending that all citizens aged between 50 and 69 years should undergo fecal OB examination. This has led to the detection of increasing numbers of asymptomatic colorectal cancer cases and a higher number of cases detected during the early disease stage which improved treatment outcomes.

Patients usually undergo a series of expensive preoperative evaluations, including colonoscopy, CT from the chest to the pelvis, and lower gastrointestinal (LGI) series. The colonoscopy and LGI series are useful for determining tumor location and CT is used to rule out distant metastasis.

In addition, several preoperative and preanesthetic routine examinations, which are relatively cost-effective, such as chest radiography, electrocardiography, and routine blood examinations are also performed. These examinations are as important as the costly evaluations listed above, and may provide crucial information that may enable the prediction of colorectal cancer prognosis.

In 2003, the pretreatment neutrophil count was

identified as a highly significant predictor for overall survival in advanced renal-cell carcinoma. Atzpodien et al. reported that a poor outcome was observed in patients with elevated neutrophil count (ANC > 6,500/mm^3).[2] In 2009, Teramukai et al. also reported that elevated pretreatment peripheral blood neutrophil count (ANC > 4,500/mm^3) was an independent poor prognostic factor in patients with advanced non-small cell lung cancer receiving chemotherapy.[3]

ALC has been used to predict survival in certain hematological diseases, including advanced Hodgkin's disease, diffuse large B-cell lymphoma,[4] and follicular lymphoma.[5] In 1976, Papatestas et al. revealed that patients with pretreatment ALC values > 2,000/mm^3 had higher 5-year survival rates in stage I, II, and III breast cancer.[6] In 2006, Fogar et al. revealed that patients with pancreatic cancer who had pretreatment ALC values < 1,200/mm^3 experienced reduced survival rates. A decrease in the ALC value was the major immunological change occurring in patients with advanced pancreatic cancer.[7] However, these outcomes have not only been observed in patients with carcinomas. Ray-Coquard et al revealed that sarcoma patients with higher pretreatment lymphocyte counts (> 1,000/mm^3) had significantly better median survival.[8]

Riess et al. first reported an association between thrombocytosis and malignancy in 19th century. In 1964, Levin et al observed that 40% of patients with thrombocytosis may also have malignant disease.[9] In the past 20 years, Naschitz et al. revealed that nearly one-third of all cancer patients had thrombocytosis at the time of diagnosis.[10] Thrombocytosis (PLT > 400,000/mm^3) was shown to be an independent poor prognostic factor in patients with gastric cancer[11] and renal cell carcinoma.[12]

After reviewing the above articles, we focused on several parameters of routine blood examination. The first parameter was the ANC. It is considered to be a surrogate marker of inflammation in the human body. The reference range of ANC is 1,800-7,000/mm^3. We can estimate the ANC by multiplying the percentage of total neutrophils (including segmented and bands) with the total number of white blood cells (WBC). The second parameter we considered was the ALC. The ALC includes T-cells, B-cells, and natural killer (NK) cells, and is considered to be a surrogate marker of immune-nutritional status. The reference range of ALC is 1,000-3,500/mm^3. We can estimate the ALC by multiplying the percentage of lymphocytes with the total number of WBC. The last parameter we chose was the PLT. The reference range of PLT is 150-400 × 10^3/mm^3, and it is easily calculated by routine blood examinations.

In the present study, we found that increasing neutrophil counts, decreasing lymphocyte counts, and increasing platelet counts in patients with colorectal cancer indicate poorer clinical outcome, irrespective of the different cut-off values.

It is known that inflammation is a component of tumor progression.[13] Many cancers originate from sites of infection, irritation, or other inflammatory conditions. The chronic inflammatory response is a trigger for tumor progression, involving invasion, migration, and metastasis. In addition, the tumor cell can also release some inflammatory cytokines, such as interleukin-1 (IL-1), IL-6, and tumor-necrosis factor-α (TNF-α) to create a microenvironment of inflammation. In 2004, Erlinger et al. indicated that inflammation was a risk factor for the development of colon cancer.[14] As the ANC is considered as a surrogate marker for inflammation, it can thus be used to predict tumor progression.

In 1957, Burnet et al. observed that lymphocytes could identify and destroy developing cancer cells,[15] and the concept of immune surveillance was first demonstrated with spontaneous tumor development in immunodeficient mice. The decrease in the ALC was associated with immunosuppression in the host. According to the immune surveillance hypothesis, immunosuppression will increase the risk of malignancy. The ALC can also be considered as a marker of nutritional status. Nutritional status influences certain postoperative factors, including wound healing, postoperative complications, tumor progression, and mortality. Therefore, the ALC can be considered a marker for the prediction of colorectal cancer prognosis.

Platelets are produced by megakaryocytes, which are derived from hematopoietic stem cells in the bone marrow. Tumor cells can activate reactive thrombo-

cytosis by releasing IL-6 and macrophage colony-stimulating factor.[16] Through the release of vascular endothelial growth factor, platelets can also promote adherence and penetration that could contribute to tumor angiogenesis and metastasis.[17] Therefore, the PLT can be considered as a marker for the prediction of colorectal cancer progression.[18]

The present study has several limitations. First, the number of patients examined is small. Although we assessed all cases presenting at the first-degree teaching hospital in Keelung City (Keelung Branch of Chang Gung Memorial Hospital), and all the operations performed by the same pair of board-certified colorectal surgeons, the total number of cases in this study was only 258. Second, compared with other similar research, our follow-up duration was relatively short. The mean follow-up duration was 39.83 months and the median follow-up duration was 42 months. In addition, in our study, we did not discuss the effect of neo-adjuvant or adjuvant therapy, such as concurrent chemo-radiotherapy or postoperative adjuvant chemotherapy.

Further studies should evaluate a combination of routine blood examination and basic chemical screening. In the present study, we indicated that patients with increased ANC values had higher C-reactive protein levels, and patients with decreased ALC values had lower albumin levels (Table 8). These parameters can be used to evaluate the systemic inflammatory status and nutritional status of patients with colorectal cancer and predict their prognosis.

The concept of adjuvant chemotherapy for patients with stage III colon cancer is well established since 1990. However, the administration of adjuvant chemotherapy to patients with stage II colon cancer is still controversial. In clinical trials, only approximately 2-5% of patients with stage II colon cancer were found to benefit from adjuvant chemotherapy. However, chemotherapy-related toxicity, treatment costs, quality of life for the patient, and other factors should be considered along with the recurrence rate and overall survival. Our research indicates that preoperative CBC/DC examinations could yield prognostic factors that may be useful in determining which patients with stage II colon cancer are high risk of poor prognosis and will benefit from adjuvant chemotherapy. In further research, we aim to develop a specific model based on preoperative routine blood sampling, which could identify poor prognosis in patients with colorectal cancer.

Table 8. The mean of CRP and albumin in different groups of ANC and ALC

Measure		ANC < 5650 N = 14	ANC > 5650 N = 17	*p* value
CRP	Mean	15.96	68.55	0.021
	SD	15.167	79.117	
Measure		ALC < 1350 N = 42	ALC > 1350 N = 102	*p* value
Albumin	Mean	3.02	3.70	< 0.001
	SD	0.672	0.573	

Reference

1. Hung HY, Chen JS, Yeh CY, Changchien CR, Tang RP, Hsieh RS, et al. Effect of preoperative neutrophil-lymphocyte ratio on the surgical outcomes of stage II colon cancer patients who do not receive adjuvant chemotherapy. *Int J Colorectal Dis* 2011;26:1059-65.
2. Atzpodien J, Royston P, Wandert T, Reitz M. Metastatic renal carcinoma comprehensive prognostic system. *Br J Cancer* 2003;88:348-53.
3. Teramukai S, Kitano T, Kishida Y, Kawahara M, Kubota K, Komutae K, et al. Pretreatment neutrophil count as an independent prognostic factor in advanced non-small-cell lung cancer: an analysis of Japan Multinational Trial Organisation LC00-03. *Eur J Cancer* 2009;45:1950-8.
4. Cox MC, Nofroni I, Ruco L, Amodeo R, Ferrari A, La Verde G, et al. Low absolute lymphocyte count is a poor prognostic factor in diffuse-large-B-cell-lymphoma. *Leuk Lymphoma* 2008;49:1745-51.
5. Siddiqui M, Ristow K, Markovic SN, Witzig TE, Habermann TM, Colgan JP, et al. Absolute lymphocyte count predicts overall survival in follicular lymphomas. *Br J Haematol* 2006;134:596-601.
6. Papatestas AE, Lesnick GJ, Genkins G, Aufses AH Jr. The prognostic significance of peripheral lymphocyte counts in patients with breast carcinoma. *Cancer* 1976;37:164-8.
7. Fogar P, Sperti C, Basso D, Sanzari MC, Greco E, Davoli C, et al. Decreased total lymphocyte counts in pancreatic cancer: an index of adverse outcome. *Pancreas* 2006;32:22-8.
8. Ray-Coquard I, Cropet C, Van Glabbeke M, Sebban C, Le Cesne A, Judson I, et al. Lymphopenia as a prognostic factor

for overall survival in advanced carcinomas, sarcomas, and lymphomas. *Cancer Res* 2009;69:5383-91.
9. Levin J, Conley CL. Thrombocytosis associated with malignant disease. *Arch Intern Med* 1964;114:497-500.
10. Naschitz JE, Yeshurun D, Eldar S, Lev LM. Diagnosis of cancer-associated vascular disorders. *Cancer* 1996;77:1759-67.
11. Ikeda M, Furukawa H, Imamura H, Shimizu J, Ishida H, Masutani S, et al. Poor prognosis associated with thrombocytosis in patients with gastric cancer. *Annals Surgical Oncology* 2002;9:287-91.
12. Erdemir F, Kilciler M, Bedir S, Ozgok Y, Coban H, Erten K. Clinical significance of platelet count in patients with renal cell carcinoma. *Urol Int* 2007;79:111-6.
13. Coussens LM, Werb Z. Inflammation and cancer. *Nature* 2002;420:860-7.
14. Erlinger TP, Platz EA, Rifai N, Helzlsouer KJ. C-reactive protein and the risk of incident colorectal cancer. *JAMA* 2004;291:585-90.
15. Burnet M. Cancer; a biological approach. I. The processes of control. *Br Med J* 1957;1:779-86.
16. Hollen CW, Henthorn J, Koziol JA, Burstein SA. Elevated serum interleukin-6 levels in patients with reactive thrombocytosis. *Br J Haematol* 1991;79:286-90.
17. Dvorak HF, Brown LF, Detmar M, Dvorak AM. Vascular permeability factor/vascular endothelial growth factor, microvascular hyperpermeability, and angiogenesis. *Am J Pathol* 1995;146:1029-39.
18. Costantini V, Zacharski LR, Moritz TE, Edwards RL. The platelet count in carcinoma of the lung and colon. *Thromb Haemost* 1990;64:501-5.

原　著

利用簡單的術前血液常規檢查預估大腸直腸癌預後

游彥麟　范仲維　曾文科

長庚紀念醫院　基隆分院　肛門直腸科

近年來大腸直腸癌是國內癌症死亡率第三名的疾病。也由於此原因國民健康局開始對所有 50 到 69 歲的國民推行從糞便潛血試驗檢查。也因為此一政策，有越來越多新的、沒有症狀的大腸直腸癌患者被診斷出來。而我們希望可以藉由一些術前的常規檢驗，是否可以發現一些因子進而來預測大腸直腸癌術後的狀況。

我們統計了從 2006 年 9 月到 2008 年 11 月共 371 位在基隆長庚紀念醫院被確診為大腸直腸癌患者的病歷資料，其中有 258 位病人接受了手術治療。而其中 161 位病人有完整的術前血液常規檢查報告。手術之後，我們統計了病人的基本資料、血液常規檢查、病理報告以及追蹤資料來進行研究。

在我們的資料庫當中，若大腸直腸癌病患的術前血液常規檢查中：ANC > 5,650/mm^3、ALC < 1,350/mm^3 以及 PLT > 360,000/mm^3。病人術後將有較高的復發機率以及較低的五年存活比率。除此之外，對照了病理報告之後，有以上特徵的病人，其病理報告腫瘤直徑大於五公分的比例以及有周邊神經源侵犯的比例也較高。經過多變像分析之後，ANC > 5,650/mm^3、ALC < 1,350/mm^3 兩項因子對於術後五年存活率而言皆是獨立的變相因子。

其實血液常規檢驗對術前評估而言是一項基本的檢查，而我們可以很輕易的經由術前血液常規檢驗來得到 ANC、ALC、以及 PLT 的數值。相對於其他較昂貴的檢驗，也許簡單的術前血液常規檢查，將可以有效的運用在對大腸直腸癌病人術後的預後評估。

關鍵詞　大腸直腸癌、白血球、血小板、預後。