

Correlation between white blood cell count and intestinal resection in patients with acute mesenteric vein thrombosis

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Research Article

Keywords: White blood cell count, Acute mesenteric vein thrombosis, Enterectomy

Posted Date: May 3rd, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1535223/v1>

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Abstract

Objective: Acute mesenteric vein thrombosis (AMVT) is one of the acute abdominal diseases with onset, rapid progression, extensive intestinal necrosis, and requiring immediate surgical resection. The purpose of this study was to determine the risk factors of nosocomial intestinal resection in patients with AMVT.

Methods: We retrospectively analyzed 64 patients with AMVT diagnosed by CTA in Affiliated Hospital of Kunming University of Science and Technology from January 2013 to December 2021. We compared patients who underwent intestinal resection (42 cases) with those who did not undergo intestinal resection (22 cases). The area under the ROC curve was evaluated and the forest map was drawn.

Results: Among the 64 patients, 6 cases (9.38%) had a fever, 60 cases (93.75%) had abdominal pain, 9 cases (14.06%) had a history of diabetes, 8 cases (12.5%) had a history of deep vein thrombosis (DVT), and 25 cases (39.06%) had ascites suggested by B ultrasound or CT after admission. The mean age of all patients was (49.86±16.25) years. The mean age of patients in the enterectomy group was (47.71±16.20) years. The mean age of patients in the conservative treatment group (without enterectomy) was (53.95±15.90) years. In univariate analysis, there were statistically significant differences in leukocyte count (P=0.003), neutrophil count (P=0.001), AST(P=0.048), total bilirubin (P=0.047), fibrinogen (P= 0.022) and DD2 (P= 0.024) between the two groups. Multivariate logistic regression analysis showed that admission white blood cell count (OR=1.153, 95%CI: 1.039-1.280P =0.007) was an independent risk factor for intestinal resection in patients with AMVT. ROC curve showed that white blood cell count (AUC=0.759 95%CI: 0.620-0.897P =0.001 optimal threshold :7.815 sensitivity: 0.881 specificity: 0.636) had a good predictive value for emergency enterectomy for AMVT.

Conclusions: Among patients with AMVT, patients with a higher white blood cell count at admission were more likely to have intestinal necrosis and require emergency enterectomy. This study is helpful for clinicians to accurately determine whether emergency intestinal resection is needed in patients with AMVT after admission, prevent further intestinal necrosis, and improve the prognosis of patients.

Introduction

Although the mesenteric vein accounts for less than 10% of the intestinal blood supply^[1], acute intestinal necrosis caused by is relatively common in clinical. Septic shock caused by acute mesenteric vein necrosis is still one of the most serious complications, regardless of whether the portal vein is involved by thrombosis^[2]. At the same time, postoperative intestinal stenosis, short bowel syndrome and other complications also seriously affect the prognosis of patients^[3]. According to reports, early active anticoagulation after admission can effectively reduce the incidence of intestinal necrosis^[4], and anticoagulation has become a first-line treatment to significantly improve the prognosis of patients with mesenteric vein thrombosis, becoming a necessary condition for successful non-surgical treatment^[5]. The prognosis of patients with acute mesenteric thrombosis is different, and the most important factors leading to death of patients are intestinal necrosis, toxin absorption into the blood, septic shock, and

finally death. It is generally believed that intestinal necrosis should be considered when there is an obvious peritoneal stimulation sign, bloody ascites in abdominal puncture, and general deterioration of the body. Laparoscopic exploration and intestinal resection should be performed immediately to stop the development of the disease. The diagnosis and timely surgical treatment of intestinal necrosis are closely related to the prognosis of patients^[6]. The aim of this study was to assess risk factors for patients undergoing emergency enterectomy and to improve survival and outcomes in these patients.

Methods

Data And Research Population

A total of 64 patients confirmed by CTA in Affiliated Hospital of Kunming University of Science and Technology from January 2013 to December 2021 who underwent intestinal resection after admission were enrolled as the experimental group (42 cases). A total of 22 patients without intestinal resection (conservative treatment) were used as the control group. All patients gave informed consent to the study. Inclusion criteria: patients confirmed by CTA, and exclusion criteria: patients with any clinical data loss. This study was approved by the Ethics committee of the Faculty of Medicine, Kunming University of Science and Technology.

Data Collection

All included patients were divided into the enterectomy group and the conservative treatment group (no enterectomy) according to whether or not they underwent surgery after admission. The included data included age, fever, and abdominal pain after admission, history of hypertension, diabetes, deep vein thrombosis, and smoking history, as well as blood routine, biochemical, and ascites after admission.

Statistical method

Sppss22.0 was used for data analysis in this study. T-test was used for variables conforming to the normal distribution, a rank-sum test was used for variables not normally distributed, chi-square test and Fisher's probability method were used for categorical variables. The data with $P < 0.05$ were included in binary logistic regression analysis to obtain the OR value and 95% confidence interval, and the forest map was drawn. ROC curve was drawn for variables included in the binary logistic regression model to obtain the area under the curve to predict whether patients with mesenteric vein thrombosis need active surgical exploration and enterectomy after admission.

Result

Clinical characteristics

There were a total of 64 patients, 42 patients who underwent enterectomy were included in the experimental group, and 22 patients who received conservative treatment (without enterectomy) were included in the control group. The average age of all patients was 49.85 ± 16.25 years old, 47.71 ± 16.20

years old in the surgery group, and 53.95 ± 15.90 years old in the conservative treatment group. Male patients accounted for 73.44%, 31 patients (48.44%) had smoked before, 6 (9.38%) had fever after admission, 60 (93.75%) had abdominal pain, 9 (14.06%) had a history of diabetes, and 8 (12.5%) had history of a deep vein thrombosis (DVT). 25 patients (39.06%) were diagnosed with ascites by B-ultrasound or CT after admission. After admission, a total of 38 patients (59.38%) had white blood cell count higher than the upper limit of normal value, 6 patients (9.38%) had AST higher than the upper limit of normal value, and 10 patients (15.63%) had abnormal creatinine value. The level of fibrinogen in 42 patients (65.66%) exceeded the upper limit of normal value, and DD2 in 58 patients (90.66%) exceeded the upper limit of normal value.

Univariate analysis

Univariate analysis showed that leukocyte count ($P = 0.003$), neutrophil count ($P = 0.001$), AST ($P = 0.048$), total bilirubin ($P = 0.047$), fibrinogen ($P = 0.022$), DD2 ($P = 0.024$) were significantly different between the enterectomy group and the group without enterectomy.

Multivariate analysis of enterectomy after admission in patients with acute mesenteric vein thrombosis

Multivariate logistic regression analysis showed that admission white blood cell count (OR = 1.153, 95%CI: 1.039-1.280 $P = 0.007$) was an independent risk factor for enterectomy in patients with after admission.

Predictive value of ROC curves and forest map

ROC curve showed that the AUC of white blood cell count predicting enterectomy for patients after admission was 0.759, 95%CI was 0.620–0.897, the optimal critical value was 7.815, sensitivity was 0.881, specificity was 0.636, the P value was 0.001. Forest plot showed that the OR value of this study was 1.153, 95%CI: 1.039–1.280, and P value was 0.007, indicating that white blood cell count was an independent risk factor for enterectomy in patients after admission.

Discussion

The main function of the Mesenteric vein is to transport small intestine absorption of nutrients, belongs to the mixed blood, once the mesenteric vein thrombosis, is not only transportation function was damaged, the patient will appear different degrees of intestinal ischemia, however, due to the superior mesenteric artery and branch blood vessels that supply the intestinal of higher^[7], patients with intestinal ischemia compensatory time longer, Therefore, the onset of in patients with insidiously, although the

same initial symptoms as another acute abdomen, often ignored by the first doctor, or even misdiagnosed, resulting in patient delay, and even death.

At present, the overall mesenteric vein thrombosis disease is rare^[8], because less than 10% are caused by mesenteric vein thrombosis, the incidence of intestinal ischemia in patients with acute mesenteric venous thrombosis need emergency surgery to remove mainly lies in whether patients with peritoneal irritation^[9, 10], whether circulating shock, and whether a bloody ascites^[11], These three aspects to a certain extent determine whether patients need surgical treatment after admission. However, no specific biomarkers^[12] have been widely used in clinical practice to reflect patients' systemic inflammation, liver function, kidney function and other biomarkers. This study included 8 years of well-documented clinical data from grade III, GRADE A hospitals and concluded that white blood cell count was an independent risk factor for emergency enterectomy in patients with acute mesenteric venous thrombosis. This feature may have some practical value in future emergency surgical intervention. Thirty-seven of the 42 patients who underwent bowel resection had white blood cell counts above the optimal threshold.

An elevated white blood cell count does not, however, determine the severity of acute abdomen^[13]. However, it has been reported that white blood cell count can be an important predictor of intestinal necrosis caused by intestinal ischemia^[14, 15]. In this study, increased white blood cell count was an independent factor associated with intestinal resection in patients with acute mesenteric thrombosis after admission. In the intestinal resection group, 54.76% (23/42) patients had a WBC count greater than $12.87 \times 10^9/L$ for the first time on admission. Although the accumulation of inflammatory factors in the early stage of thrombosis would lead to a slight increase in WBC, the further increase in WBC count might be caused by further intestinal necrosis and bacterial displacement. It often indicates the further development of the disease, requiring emergency exploratory laparotomy or even enterectomy. According to Kim et al.^[16], leukocyte level in MVT patients was associated with intestinal infarction, while Nuzzo et al.^[17] Also reported that in the acute abdomen caused by abdominal pain, increased leukocyte count should cause attention to intestinal ischemia and necrosis. This study other inflammation, blood clotting function, laboratory indexes of liver and kidney function of the patients with acute mesenteric venous thrombosis after admission whether to acute intestinal resection showed no correlation, especially used to patients with diabetes should be emergency intestinal resection^[18], but have not been confirmed in this study, it may be associated with research sample size and incorporated into the standard, Further studies are needed to confirm this.

Arteriovenous reflection principle^[19] is confirmed in patients with acute mesenteric venous thrombosis, venous thrombosis not only lead to bowel ischemia, followed by arterial spasm, further reduce the patients with intestinal blood supply, although the spasm can prevent the accumulation of interstitial fluid, but in patients with bowel necrosis, increasing insufflates consumption, degradation insufflate blood supply, This principle has been demonstrated in rats^[20].

In conclusion, our study found that in patients with acute mesenteric venous thrombosis, white blood cell count and for the first time to admission line is closely relative to the possibility of intestinal resection surgery, in such patients, bowel, bacterial translocation and venous ischemia artery spasm in irreversible necrosis occurs to insufflate plays a corresponding role in the process, should be early and timely diagnosis, To prevent further intestinal necrosis and death.

Conclusions

This study concluded that white blood cell count was an independent risk factor for enterectomy after admission in patients with . Early diagnosis, timely detection of intestinal necrosis and timely surgical resection of necrotic bowel are the priorities in the treatment of this disease, which has important positive significance for postoperative recovery and improvement of life quality of patients.

Declarations

Ethics approval and consent to participate

This study has been approved by the Medical Ethics Committee of Kunming University of Science and Technology (Number KMUST-MEC-145).

Consent for publication

Not Applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

Funding

This study was supported by the Joint Fund of Yunnan province, China(202001AY070001-131).

Author Contributions

Yu Xu and Shang-Tai Dai are major contributors in writing the manuscript, Yang-Mei Xie conceptualized the idea, and Shi-Kui Guo and Kun-Mei Gong controls the quality of this manuscript. Hong-Qiao Lu, Guo-San Li, Yang-Qiu-Rong Zhang and Wen-Sha Sun contributed to the data collection and analysis. All authors read and approved the final manuscript.

Acknowledgements

Thanks to the department of General Surgery, Affiliated Hospital of Kunming University of Science and Technology, for supporting this research data.

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Tables

Table 1 Basic characteristics of all patients included in the study

	The overall (n=64)	Surgery (n=42)	No surgery (n=22)	P
Gender (Male/female)	47/17	29/13	18/4	0.272
Age	49.86±16.25	47.71±16.20	53.95±15.90	0.146
Fever (yes/No)	6/58	5/37	1/22	0.665
Abdominal pain (yes/no)	60/4	39/3	21/1	0.574
Hypertension (yes/No)	8/56	4/38	4/18	0.430
Diabetes (yes/no)	9/55	6/36	3/19	0.630
DVT(yes/no)	8/56	4/38	4/18	0.430
Smoking history (yes/No)	31/33	21/21	10/12	0.730
WBC (×10 ⁹ /L)	12.87±7.13	16.73±6.67	9.33±6.76	0.003
Neutrophils (×10 ⁹ /L)	9.64±4.46±14.59	11.67±8.19±14.87	4.43±3.54±9.62	0.001
HGB	142±120±156	143±120±156	142±120±155	0.761
PLT	189±130±253	189±128±228	211±137±270	0.458
AST	22±16±29	18±14±29	24±20±34	0.048
ALT	19±14±32	19±14±33	18±15±35	0.635
Total bilirubin	15.4±11.7±22.9	16.4±12.6±27.8	13.4±10.6±20.3	0.047
Direct bilirubin	6.8±4.7±10.6	7.7±5.7±12.8	6.3±4.3±7.7	0.064
Indirect bilirubin	8.8±6.3±13.0	9.4±7.0±13.9	7.4±5.4±11.1	0.066
Cr	70±61±89	69±58±85	72±64±104	0.164
Blood type A/B/AB/O	21/8/20/15	12/4/16/10	9/4/4/5	0.337
K+	4.1±3.8±4.4	4.1±3.8±4.4	4.2±3.7±4.3	0.164
Ascites (yes/no)	25/39	12/25	8/14	0.793
FIB	4.4±3.2±6.2	5.0±3.9±6.3	3.9±3.0±5.2	0.022
APTT	38.42±4.66	38.41±4.73	38.43±4.63	0.984
PT	14.5±13.6±15.3	14.7±13.9±15.4	13.7±13.5±15.0	0.090
DD2	12.3±5.1±19.3	14.5±6.5±21.8	9.3±2.9±15.7	0.024

Table 2 Multivariate logistics analysis of emergency enterectomy in AMVT patients

	OR	95%CI	P
WBC	1.153	1.039~1.280	0.007

Table 3 ROC curve of white blood cell count predicts enterectomy at admission in AMVT patients

	AUC	95%CI	P	Optimum critical value	Sensitivity	Specificity
WBC	0.759	0.620~0.897	0.001	7.815	0.881	0.636

Figures

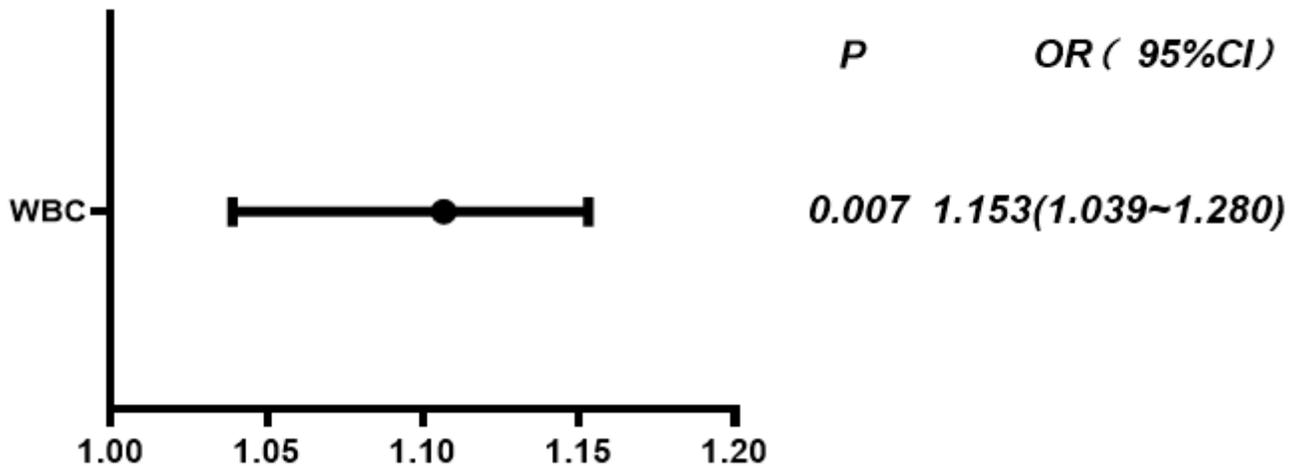


Figure 1

Multivariate logistics analysis – Forest map

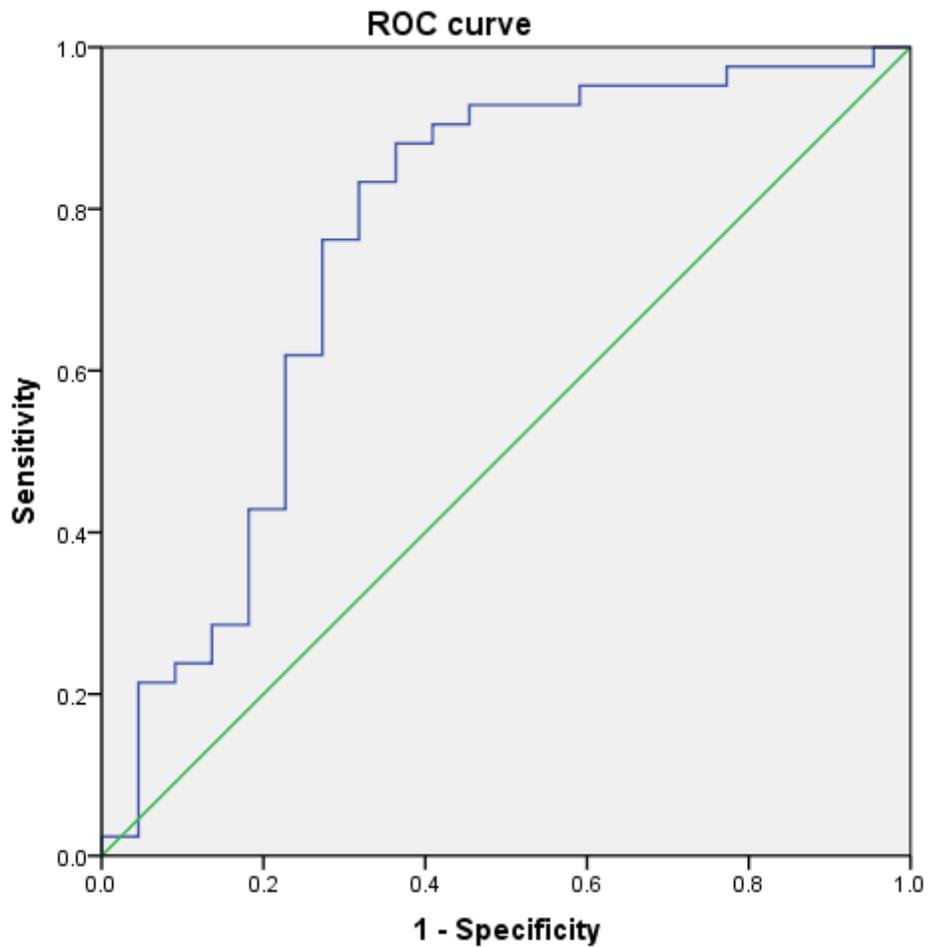


Figure 2

ROC curve of white blood cell count predicts enterectomy at admission in AMVT patients

Supplementary Files

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