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Research Article

Predictive Value of Serum Albumin and Cholinesterase Levels for Adverse Outcomes In Patients with Acute Non-Variceal Upper Gastrointestinal Bleeding

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Abstract

Objective To identify the clinical predictive value of serum albumin and cholinesterase on adverse outcomes in patients with acute non-variceal upper gastrointestinal bleeding.

Methods A total of 70 patients with acute non-variceal upper gastrointestinal bleeding who were diagnosed and treated in the Seventh Affiliated Hospital of Sun Yat-sen University from June 2020 to December 2021 were selected in this study. According to whether there was any adverse outcome during admission (blood transfusion, gastroscope or surgical intervention, ICU admission, rebleeding, death, any one or more was considered to have an adverse outcome), they were divided into a poor outcome group (n=39) and a good outcome group (n= 31 cases). Spearman correlation was used to analyze the relationship between albumin (ALB), cholinesterase (ChE) and hemoglobin (Hb) 24h after admission. Receiver operating characteristic curve (ROC curve) was used to evaluate the predictive value of ALB, ChE, and their combined detection for adverse outcomes in patients with acute non-variceal upper gastrointestinal bleeding.

Result The ALB, ChE and Hb values of the patients in the poor outcome group were lower than those in the good outcome group, and the difference between the two groups was statistically significant (P<0.05). The results of Spearman correlation analysis showed that ALB and ChE were positively correlated with Hb and outcome (P<0.05), and the difference was statistically significant. The results of ROC curve analysis showed the combination of ALB and ChE levels (AUC 0.889, 95% CI 0.814-0.964, sensitivity 0.846, specificity 0.806)can better predict the adverse outcome of patients with acute non-variceal gastrointestinal bleeding.

Conclusion ALB and ChE at 24h after admission are closely related to adverse outcomes such as blood transfusion, gastroscopic or surgical intervention, ICU admission, rebleeding, and death for acute non-variceal gastrointestinal bleeding, and have some predictive value.

Keywords: *Albumin; cholinesterase; upper gastrointestinal bleeding; adverse outcome*

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Introduction

Acute non-variceal upper gastrointestinal bleeding is one of the most commonly acute and critical illnesses in emergency departments with high morbidity. If not identified and intervened in time, it may lead to high mortality. A retrospective large-sample case analysis in China [1] showed that peptic ulcer bleeding (52.7%) was

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still the most important cause of upper gastrointestinal bleeding (UGIB), and the overall mortality was not significantly lower than before. In recent years, many studies[2] have shown that various scoring systems such as Glasgow Blatchford score (GBS), AIMS65, Rockall scoring system can be used to evaluate the prognosis of patients with gastrointestinal bleeding, but the calculation is more complicated.

ZHAO et al.[3]pointed out that a shock index >0.7 in patients with upper gastrointestinal bleeding can effectively predict adverse outcomes, such as the need for intensive care, blood transfusion, and endoscopic therapy. Huang Hanli et al.[4]found that serum prealbumin and cholinesterase are closely related to the occurrence and development of acute gastrointestinal bleeding in stroke patients, which is helpful for early screening of acute gastrointestinal bleeding. Some studies have also found [5] that patients with liver cirrhosis and acute upper gastrointestinal bleeding are more likely to have lower albumin and cholinesterase. There are few studies on the relationship between albumin, cholinesterase and patients with acute non-variceal gastrointestinal bleeding. The purpose of this study was to analysize the relationship between the albumin、cholinesterase levels and the adverse outcomes of patients with acute non-variceal upper gastrointestinal bleeding, and to provide a basis for clinical evaluation of prognosis.

Materials and Methods

1. General data: 70 patients with acute non-variceal gastrointestinal bleeding who were diagnosed and treated in the Seventh Affiliated Hospital of Sun Yat-sen University from June 2020 to December 2021 were selected as the research subjects, and the clinical data of the patients, including gender, age, Admission 24h albumin value, cholinesterase value, admission hemoglobin value, blood transfusion, ICU admission, gastroscope/surgery hemostasis, death, and rebleeding. According to whether there was an adverse outcome at discharge, the patients were divided into a poor outcome group (n=39) and a good outcome group (n=31 cases). There were 39 patients in the poor prognosis group, including 20 males and 19 females, aged 32-86 years (57.03±16.73), 7 patients with hypertension, 8 patients with coronary heart disease, and 5 patients with diabetes. 32 cases of blood transfusion, 13 cases of ICU admission, 6 cases of gastroscopy or surgical intervention, 1 case of death, and 3 cases of rebleeding. There were 31 cases in the good prognosis group, including 17 males and 14 females, aged 20-85 years (48.35±13.91), 5 cases of hypertension, 10 cases of coronary heart disease, and 2 cases of diabetes. There was no significant difference in the basic data of the two groups of patients (P>0.05).

2.Inclusion criteria: 1. Age > 18 years old; 2. Clinical manifestations of hematemesis, melena, hemorrhagic shock, and non-variceal gastrointestinal bleeding diagnosed by gastroscope; Exclusion criteria: (1) History of liver cirrhosis, Patients with esophageal and gastric varices bleeding; (2) complicated with severe liver disease, kidney disease, malignant tumor, etc.; (3) long-term use of glucocorticoids; (4) incomplete medical records, including automatic discharge, and missing data. Rebleeding was defined as cessation of bleeding after fluid resuscitation or endoscopic therapy followed by hematemesis, melena, and a progressive decrease in hemoglobin level.

3.Statistical methods: SPSS 26.0 was used for statistical analysis, the comparison of measurement data was expressed as mean±standard deviation ($x \pm s$), t test was performed, and $P<0.05$ was considered statistically

significant. Spearman correlation was used to analyze the relationship between ALB, ChE and Hb, and outcome, and the receiver operating characteristic curve (ROC) was used to analyze the predictive value of ALB, ChE, and ALB+ChE combined detection for the adverse outcome of non-variceal upper gastrointestinal bleeding.

4. Results

4.1 Comparison of ALB and ChE levels between the two groups of patients

The levels of ALB, ChE, and Hb in the two groups of patients: the mean ± SD of ALB, ChE, and ALB in the poor prognosis group were: 31.635 ± 4.7332, 4338.33 ± 1368.720, 73.21 ± 19.549, which were lower than the ALB, ChE, and ALB levels in the good prognosis group, respectively. Hb (38.694±4.8962, 6324.48±1312.137, 108.32±25.725), the difference was statistically significant. (Table 1).

Table 1 Comparison of ALB and ChE levels in the two groups of patients

Group	n	ALB（g/L）	ChE(U/L)	Hb(g/L)
Bad outcome	39	31.635±4.7332	4338.33±1368.720	73.21±19.549
No adverse outcome	31	38.694±4.8962	6324.48±1312.137	108.32±25.725
t		6.104	6.141	6.491
P		＜0.001	＜0.001	＜0.001

4.2 Comparison of Spearman correlation of ALB, ChE with Hb and outcome

Correlation analysis of ALB, ChE and Hb: r values were 0.541, 0.589, P<0.05, ALB, ChE were positively correlated with Hb, higher ALB, ChE indicated higher Hb value. Correlation analysis between ALB, ChE and outcome: r values were 0.601, 0.612, P<0.05, it was concluded that ALB and ChE were positively correlated with outcome, and higher ALB and ChE had better prognosis（Table 2）.

4.3 The predictive value of ALB and ChE for non-variceal gastrointestinal bleeding

ROC analysis of ALB, ChE, ALB+ChE: ALB: AUC: 0.849, 95%CI: 0.762-0.937, sensitivity: 0.64, specificity 0.968; ChE: AUC: 0.854, 95%CI: 0.766-0.942, sensitivity 0.802 , with a specificity of 0.71. ALB+ChE: AUC 0.889, 95% confidence interval 0.814-0.964,Sensitivity 0.846,Specificity 0.806.The combined detection of ALB and ChE has the greatest predictive value for non-variceal gastrointestinal bleeding (Figure 1).

Table 2 Spearman correlation analysis of ALB, ChE and Hb and outcome

Factor	Hb		outcome	
	r	P	r	p
ALB	0.541	P＜0.05	0.601	P＜0.05
ChE	0.589	P＜0.05	0.612	P＜0.05

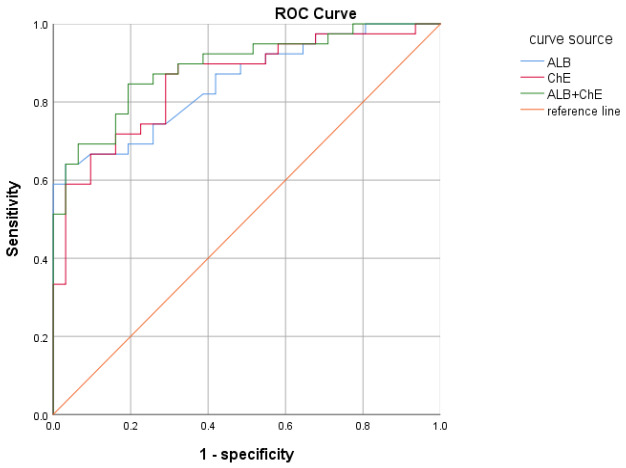

Figure 1. predictive value of ALB and ChE for non-variceal gastrointestinal bleeding

Discussion

Gastrointestinal hemorrhage is a common clinical, serious and potentially life-threatening gastrointestinal emergency. Due to the widespread use of non-steroidal drugs and anticoagulants in recent years, bad living habits have led to more and more acute non-variceal gastrointestinal bleeding[6]. In addition, elderly patients tend to have fewer initial symptoms, and their blood transfusion rate, rebleeding rate, hospitalization rate, and mortality rate are all higher. Therefore, it is crucial to find clinically accessible and objective biomarkers for rapid assessment of the condition and prognosis of patients with gastrointestinal bleeding. Simple and easy-to-obtain indicators such as hemoglobin, coagulation, lactic acid, and shock index have been widely used in clinical evaluation of patients with gastrointestinal bleeding. ALB and ChE are easy-to-obtain indicators.

ALB is a medium-sized protein molecule synthesized by the liver and is a major component of plasma osmotic pressure. When the body has acute gastrointestinal bleeding, a large amount of blood volume loss may lead to excessive loss of albumin, resulting in decreased albumin[7]. However, due to hemoconcentration, the albumin level at the initial visit cannot represent the real albumin value in the body, so this study selected the albumin level at the 24-hour after admission. In addition, the decreased rate of albumin synthesis and enhanced catabolism under acute stress also lead to a decrease in albumin. This study found that albumin was positively correlated with hemoglobin. A lower albumin value means a lower hemoglobin value. Hemoglobin level is an independent risk factor for rebleeding in patients with gastrointestinal bleeding [8]. In the setting of acute blood loss, hemoglobin level may initially remain unchanged from baseline.The consensus panel[9]suggested that it is conservative to set the hemoglobin threshold at 80 g/L, and the target value should be greater than 80 g/L. For patients with acute nonvariceal gastrointestinal bleeding and underlying cardiovascular disease, transfusion at a higher hemoglobin threshold than in patients without cardiovascular disease is recommended. The study also found that albumin was significantly associated with outcomes in patients with gastrointestinal bleeding. But albumin is only predictive value.Studies[10] have found that no significant difference in resuscitation effects between albumin and normal saline in the intensive care unit, regardless of the patient's serum albumin concentration. Although albumin supplementation does not increase the risk of death, the evidence is insufficient to support routine albumin infusion in critically ill patients to maintain or increase intravascular volume.

ChE is an enzyme synthesized by hepatocytes. During acute gastrointestinal bleeding, the human body is in a state of stress, resulting in disorder of material metabolism and weakened anabolism. The consumption rate of ChE is greater than the synthesis rate, so the level of ChE

decreases. Studies have shown that intestinal bleeding, malnutrition, and concurrent ALB loss may also be one of the reasons for the decrease in serum ChE levels [11]. Sun Rou Rou et al [12] found that ChE can be used as an important indicator for the evaluation of the condition and prognosis of patients with peptic ulcer. Peptic ulcer is the main cause of gastrointestinal bleeding. The inflammatory lesions caused by ulcer may release acetylcholine through the regulation of cholinergic anti-inflammatory pathway and immune stimulation. hydrolysis of acetylcholine by ChE can lead to the decrease of ChE content in blood [13]. This study found that ChE was positively associated with Hb and adverse outcomes, with lower ChE predicting lower Hb and adverse outcomes in patients with non-variceal gastrointestinal bleeding. For critically ill patients with gastrointestinal bleeding, the reduction of serum cholinesterase is a body stress response. In addition, Chiarla C et al[14] conducted a study on 92 emergency surgery and critically ill patients, They found that serum albumin in critically ill patients is directly related to their cholinesterase levels. The lower the albumin level, the lower the cholinesterase level. The more serious the condition. This study did not do the correlation analysis between ALB and ChE.ROC curve analysis of ALB, ChE, and ALB+ChE: AUC of ALB and ChE combined detection was 0.889, which was greater than that of ALB (AUC: 0.849) and ChE (AUC: 0.854). The sensitivity of ALB combined with ChE is higher than that of ALB and ChE. It can be concluded that the combined predictive value of ALB and ChE is the greatest. In conclusion, the combined detection of ALB and ChE has certain predictive value for adverse outcomes in patients with acute non-variceal upper gastrointestinal bleeding. This study has certain limitations. On the one hand, the sample size is small, and there may be bias in the selection and analysis of patients. On the other hand, although the influence of tumor and other influences was excluded, the influence of nutritional status on the results was not excluded. Large-scale multi-center studies are still needed to further confirm the relevant conclusions.

Acknowledgments

None

Conflict of Interests

None

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