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The value of serum PCT/ALB and CRP/ALB ratios in evaluating the condition and prognosis of craniocerebral trauma

Su Yan, Bo Lu, Maoqin Li, Jiaqiong Li, Na Li

Xuzhou Central Hospital, China

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Abstract

Introduction: *The aim of the study was to explore the value of serum procalcitonin to albumin (PCT/ALB) and C-reactive protein to albumin (CRP/ALB) ratios in evaluating the condition and prognosis of craniocerebral trauma (CT).*

Material and methods: *158 patients with CT admitted to the emergency department of our hospital from January 2020 to June 2022 were selected as the study subjects. According to the Glasgow coma scale (GCS) score, 158 patients with CT were grouped in a mild group (GCS score 13-15 points, n = 68), a moderate group (GCS score 9-12 points, n = 61), and a severe group (GCS score 3-8 points, n = 29). Besides, according to the patient's Glasgow prognosis (GOS) score, 158 patients with CT were divided into a good prognosis group (GOS score 4-5 points, n = 110) and a poor prognosis group (GOS score 1-3 points, n = 48). Serum PCT/ALB and CRP/ALB levels of different groups were compared. The correlation between PCT/ALB and CRP/ALB ratios and the score of GCS and GOS was explored using Pearson correlation analysis. Prognosis-related influencing factors were found out through multivariate logistic regression. The value of serum PCT/ALB and CRP/ALB ratios in evaluating the condition and prognosis of CT was evaluated by the ROC curve.*

Results: *Patients in the moderate and severe groups had much higher ratios of PCT/ALB and CRP/ALB and sharply lower GCS scores than those in the mild group ($p < 0.001$). Compared with the patients in the moderate group, those in the severe group had much higher PCT/ALB and CRP/ALB ratios and obviously lower GCS scores ($p < 0.001$). Patients with poor prognosis had markedly higher PCT/ALB and CRP/ALB ratios and memorably lower GOS score than the patients with good prognosis ($p < 0.001$). A negative correlation between PCT, CRP, PCT/ALB ratio, CRP/ALB ratio and GCS scores ($r = –0.821$, $–0.857$, $–0.750$, $–0.766$, $p < 0.001$) and GOS scores ($r = –0.636$, $–0.628$, $–0.595$, $–0.628$, $p < 0.001$) was revealed by Pearson correlation analysis. ALB was correlated positively with GCS score and GOS score ($r = 0.381$, 0.413, $p < 0.001$). Multivariate logistic regression analysis exhibited that PCT/ALB ratio and CRP/ALB ratio were related to poor prognosis of CT patients ($p < 0.05$). ROC curve analysis showed that the combined PCT/ALB ratio and CRP/ALB area under the curve (AUC) were 0.883 and 0.860, respectively, which were used to assess the severity and predict prognosis of patients with CT.*

Conclusions: *PCT/ALB and CRP/ALB ratios were positively correlated with the severity and prognosis of patients with CT, and were risk factors for poor prognosis. Early determination of changes in PCT/ALB and CRP/ALB ratios had a certain clinical value for evaluating the condition and prognosis of CT patients.*

Key words: *PCT/ALB, CRP/ALB, craniocerebral trauma, condition, prognosis, value.*

Introduction

Craniocerebral trauma (CT) is a common clinical injury occurring in the head, with falling injury and collision injury being the most common. The incidence rate of CT increases year by year due to the rapid development of industry and transportation industry. Effective condition assessment and accurate prognosis prediction of CT have become the focus of medical scholars [2,13]. C-reactive protein (CRP)/albumin (ALB), procalcitonin (PCT)/ALB are emerging laboratory indicators

Communicating author:

Na Li, Xuzhou Central Hospital, Xuzhou, Jiangsu, China, e-mail: linalndr@21cn.com

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for predicting the prognosis of acute severe patients in recent years [26]. Among them, CRP and PCT are common inflammatory indicators in clinical research. In malignant tumours, cardiovascular diseases and acute bacterial pneumonia, the level of CRP is strongly increased, and the change in the CRP level is far earlier than the change in the count of peripheral blood leukocytes [17]. As a biomarker related to infection, PCT is highly expressed under the stimulation of acute infection [25]. The increase of CRP and PCT levels mostly indicates the aggravation of body injury or infection, while ALB can reflect the antiviral ability of the body. Although most studies revealed that neuroinflammatory reaction after CT aggravated nerve cell injury and inhibited nerve repair, related studies pointed out that it also played an indispensable role in promoting tissue repair after CT [3,12]. Once the inflammatory response after craniocerebral injury is overactivated, it can seriously damage the brain parenchyma. Damaged or dead cells release damage-related signalling molecules. These signalling molecules can be received by microglia and astrocytes. Then, microglia and astrocytes initiate downstream cytokine and chemokine production and form an inflammatory microenvironment that further activates microglia and astrocytes, leading to infiltration of peripheral inflammatory cells (e.g., neutrophils, monocytes, and T lymphocytes) and exacerbating secondary injury [6,8]. At present, the failure of anti-inflammatory drug treatment after CT also suggests that people need to recognize the role of neuroinflammatory reaction in the secondary changes after CT.

In order to improve the potential prediction ability of inflammatory factors in infectious diseases, studies have proved that a combined ratio of PCT/ALB and CRP/ALB reflected the level of acute inflammation and chronic nutritional status [31]. Increased PCT/ALB and CRP/ALB ratios indicated reduced inflammatory response and immunity, which had a high practical value in clinical practice and can be used to evaluate infectious diseases, sepsis, acute respiratory distress syndrome, cancer, acute and chronic pneumonia, etc. [11,33]. Some studies believed that [10] the CRP/ALB ratio had a prognosis prediction effect in patients with sepsis and acute respiratory distress syndrome. A higher CRP/ALB value indicated worse prognosis. At present, there are few studies on CRP/ALB and PCT/ALB ratios in evaluating the condition and prognosis of CT.

In this study, 158 CT patients admitted to our hospital from January 2020 to June 2022 were studied, aiming to explore the value of serum PCT/ALB and CRP/ALB ratios in evaluating the condition and prognosis of CT.

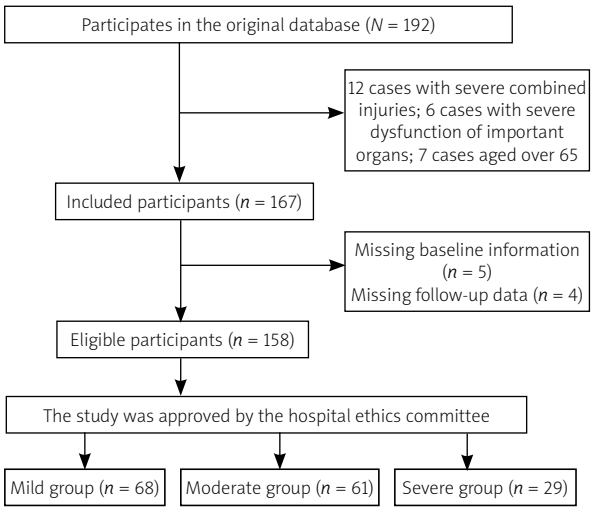

Fig. 1. Flow chart of 158 patients' general data selection.

Material and methods

General materials

One hundred and fifty-eight CT patients admitted to our hospital from January 2020 to June 2022 were studied. The selection process of general materials was shown in Figure 1. Inclusion criteria: 1) Patients with a clear history of craniocerebral injury, and brain contusion, intracranial hematoma or brain swelling were found through brain CT examination, and met clinical criteria for the diagnosis of traumatic head injury [7]; 2) The patient's age was between 18 and 65 years old; 3) All patients suffered traumatic head injury for the first time; 4) The clinical data of the patient were complete, and the follow-up was coordinated; 5) The patient and his/her family members were informed and the informed consent form was obtained. They could cooperate with the examination and treatment with good compliance. Exclusion criteria: 1) Patients with severe combined injury; 2) Those with previous neurological or psychiatric diseases; 3) Those with severe dysfunction in important organs; 4) Those with severe coagulation dysfunction. These subjects were grouped as the mild group (scored 13-15, n = 68), the moderate group (scored 9-12, n = 61) and the severe group (scored 13-15, n = 29) or the good (scored 3-8, n = 110) and poor prognosis group (scored 1-3, n = 48) according to Glasgow coma scale (GCS) score. Among them, 69 males and 41 females formed the good prognosis group, with the average age of 39.16 ±11.85 years. 33 males and 15 females, with the average age of 38.28 ±12.04 years, formed the poor prognosis group. The age and gender among these groups had no significant difference (p > 0.05). This experimental operation was ratified by our hospital Ethics Committee (Approval number: XZXY-LK-20220214-008).

Detection method

Laboratory indicators: the fasting venous blood of patients was collected, centrifuged at 3000 r/min for 5 min. After the supernatant was separated, the sample was frozen at –70°C to avoid repeated freezing and thawing. Serum PCT concentration was determined by electrochemiluminescence (The kit was purchased from Shenzhen Hisian Biotechnology Co., Ltd., Pingshan District, Shenzhen, Guangdong Province, China, brand: Roche, catalogue number: H11776258122), and CRP and ALB were examined by immunoturbidimetry (The kit was purchased from Shanghai Yaji Biotechnology Co., Ltd., Yuanjiang Road, Minhang District, Shanghai, China, catalogue number: E023).

Electrochemiluminescence: Test agents a, b and the sample to be tested (including antigen) were added to the test tube, and the reaction was carried out in the liquid phase, and completed within 5-10 minutes at 37°C. The combined labelled antibody was separated from the free labelled antibody. This process and the following electrochemiluminescence reactions were carried out in the flow pool of Elecsys. The reaction solution after the two-step reaction in the test tube was fed into the flow cell. Due to magnetic attraction, magnetic particles (The kit was purchased from Shanghai Yubo Biotechnology Co., Ltd., Miaojing Road, Minhang District, Shanghai, China, catalogue number: YB-10029; Brand: American Amresco) were attracted to the electrode, and the rest of the reaction flew out of the flow cell to complete the separation of free and bound labelled antibodies. The electron donor solution was sent to the flow cell, and the residual free labelled antibody was discharged from the flow cell, so that the flow cell was filled with the electron donor solution. After the magnet was removed, the electrode was electrified, and the tripyridine ruthenium reacted with the electron donor electrochemically. The light emitted was collected by the photomultiplier tube to measure the light intensity. The antigen concentration in the sample to be tested was obtained by conversion.

Immunoturbidimetry: 25 µl standard, 150 µl Reagent R1 and 75 µl Reagent R2 were mixed. The mixture was incubated for 3 minutes after R1 reagent and sample were added. The delay time was about 100 seconds, and the reading time lasted for about 120 seconds. The main wavelength was 500 nm, without the secondary wavelength. Multi-point calibration (without water blank) and multi-parameter curve fitting (Spline or Logit/log) were adopted.

Disease and prognosis assessment

Assessment of the severity of the disease: GCS score [1] included three items: eye movement, language response and limb movement, with a score range of 3-15 points. Clear consciousness, mild disturbance of consciousness, moderate disturbance of consciousness and coma had a score of 15, 12-14, 9-11 and below 8. Patients with the mild, moderate and severe disease were judged by the points of 13-15, 9-12 and 3-8, respectively. The lower score indicated more serious disturbance of consciousness.

Prognosis evaluation: GOS score includes 1-5 points. 5 indicates good recovery: the patient returns to normal life with slight defects; 4 means mild disability: the patient is disabled but he/she can live independently and work under protection; 3 indicates severe disability: the patient is awake and disabled, and he/she needs to be cared for in daily life; 2 means vegetative survival state: the patient has only minimal reaction (for example, with the sleep/wakefulness cycle, the eyes can be open); 1 point indicates: death. Higher GOS score indicated better prognosis.

Statistical analysis

SPSS20.0 software was used for the data analysis. The Shapiro-Wilk normal distribution test was used to check the normality of the data. The measurement data conforming to the normal distribution was expressed as ($x \pm s$), and compared by the *t*-test. Analysis of variance (*F* test) was used for comparison between multiple samples. When the conditions of analysis of variance could not be met, non-parametric test (Kruskal-Wallis) was used for data analysis, and the comparison between two samples was conducted using SNK-q test. Enumeration such as the gender were expressed in the form of percentage (%), and were compared according to χ^2 test. The correlation between PCT/ALB and CRP/ALB ratios and the score of GCS and GOS was explored using Pearson correlation analysis. Prognosis related influencing factors were found out through Multivariate logistic regression. The value of serum PCT/ALB and CRP/ALB in the evaluation and prognosis of CT was evaluated by ROC curve. $P < 0.05$ indicated that the statistical results were statistically significant.

Results

Comparison of serum PCT/ALB and CRP/ALB ratios in patients in different conditions

Patients in the moderate and severe groups had a much higher level of PCT, CRP, higher ratios of PCT/ALB and CRP/ALB, sharply lower GCS scores and ALB content than those in the mild group ($p < 0.001$). Compared with the patients in the moderate group, those in the severe group had a much higher level of PCT, CRP, higher ratios of PCT/ALB and CRP/ALB, obviously

lower GCS scores and ALB content ($p < 0.001$) (Table I and Fig. 2).

Comparison of serum PCT/ALB and CRP/ALB ratios in patients with different prognosis

Patients in the poor prognosis group had larger ratios of PCT/ALB and CRP/ALB, much higher content of PCT and CRP ($p < 0.001$), memorably lower GOS score and ALB level than those in the good prognosis group ($p < 0.001$) (Table II and Fig. 3).

Correlation analysis of PCT/ALB and CRP/ALB ratios with GCS score and GOS score

Procalcitonin, CRP, PCT/ALB ratio, CRP/ALB ratio had a negative correlation with GCS scores ($r = –0.821$, –0.857, –0.750, –0.766, $p < 0.001$) and GOS scores ($r = –0.636$, –0.628, –0.595, –0.628, $p < 0.001$), which was proved by Pearson correlation analysis. Albumin was correlated positively with the score of GCS and GOS ($r = 0.381$, 0.413, $p < 0.001$) (Table III and Fig. 4).

Table I. Comparison of serum PCT/ALB and CRP/ALB ratios in patients in different conditions (x ±s)

Indicators	The mild group ($n = 68$)	The moderate group ($n = 61$)	The severe group ($n = 29$)	F	P
PCT (ng/l)	10.45 ±2.08	21.23 ±2.58[a]	30.91 ±3.64[ab]	681.60	< 0.001
CRP (mg/l)	77.52 ±10.26	132.26 ±4.88[a]	184.26 ±24.52[ab]	768.82	< 0.001
ALB (g/l)	31.21 ±5.15	28.33 ±4.89[a]	25.54 ±3.16[ab]	15.68	< 0.001
PCT/ALB	0.33 ±0.03	0.75 ±0.18[a]	1.21 ±0.36[ab]	229.28	< 0.001
CRP/ALB	2.48 ±0.58	4.67 ±1.03[a]	7.21 ±1.58[ab]	237.02	< 0.001
GCS score	13.26 ±1.56	10.45 ±1.28[a]	5.36 ±1.75[ab]	284.97	< 0.001

[a] *p < 0.05 compared with the mild group,* [b] *p < 0.05 compared with the moderate group*

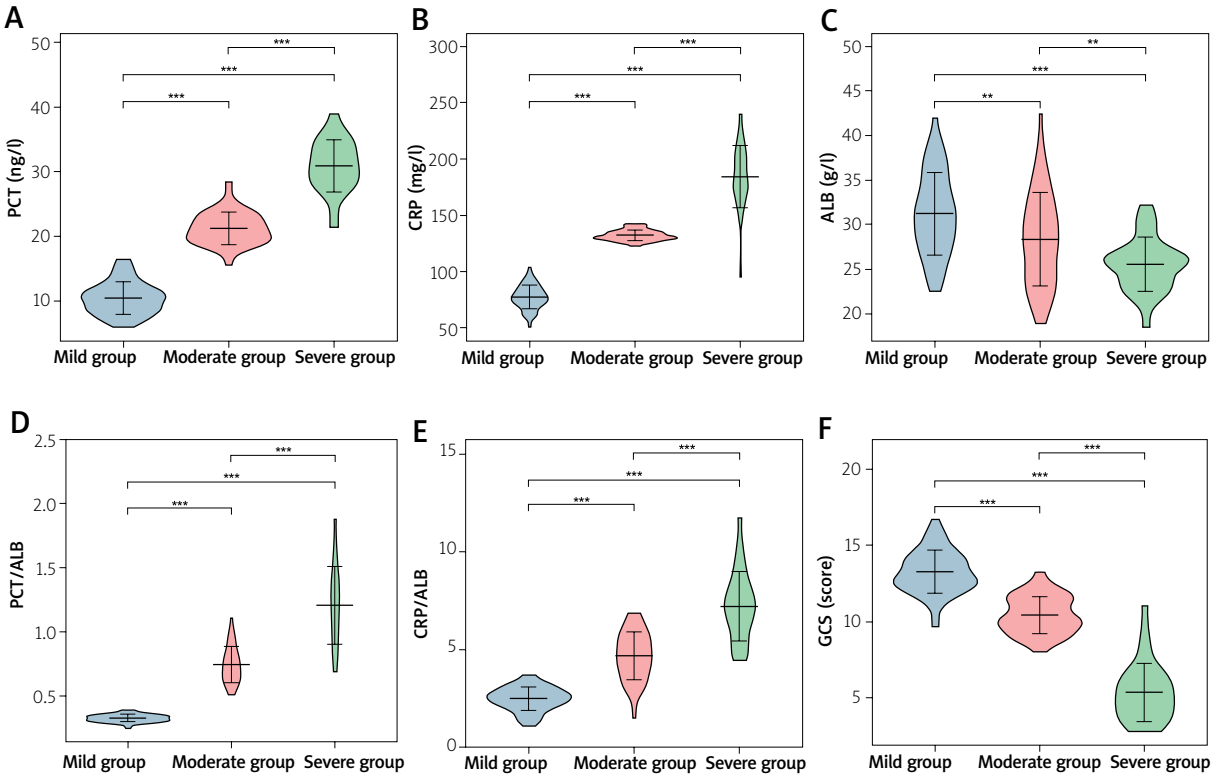

Fig. 2. Comparison of serum PCT/ALB and CRP/ALB ratios in patients in different conditions. **A**) Comparison of PCT levels; **B**) Comparison of CRP levels; **C**) Comparison of ALB levels; **D**) Comparison of PCT/ALB levels; **E**) Comparison of CRP/ALB levels; **F**) Comparison of GCS levels. **$p < 0.01$ compared between groups, ***$p < 0.001$ compared between groups.

Table II. Comparison of serum PCT/ALB and CRP/ALB ratios in patients with different prognosis (x ±s)

Indicators	Good prognosis group (*n* = 110)	Poor prognosis group (*n* = 48)	*t*	*P*
PCT (μg/l)	9.26 ±2.10	31.88 ±4.25	44.790	< 0.001
CRP (mg/l)	69.25 ±9.37	180.41 ±32.33	33.128	< 0.001
ALB (g/l)	33.42 ±4.89	28.10 ±2.87	7.021	< 0.001
PCT/ALB	0.28 ±0.09	1.35 ±0.69	16.019	< 0.001
CRP/ALB	2.07 ±0.57	6.42 ±1.74	23.560	< 0.001
GOS score	4.45 ±1.25	2.16 ±0.85	11.569	< 0.001

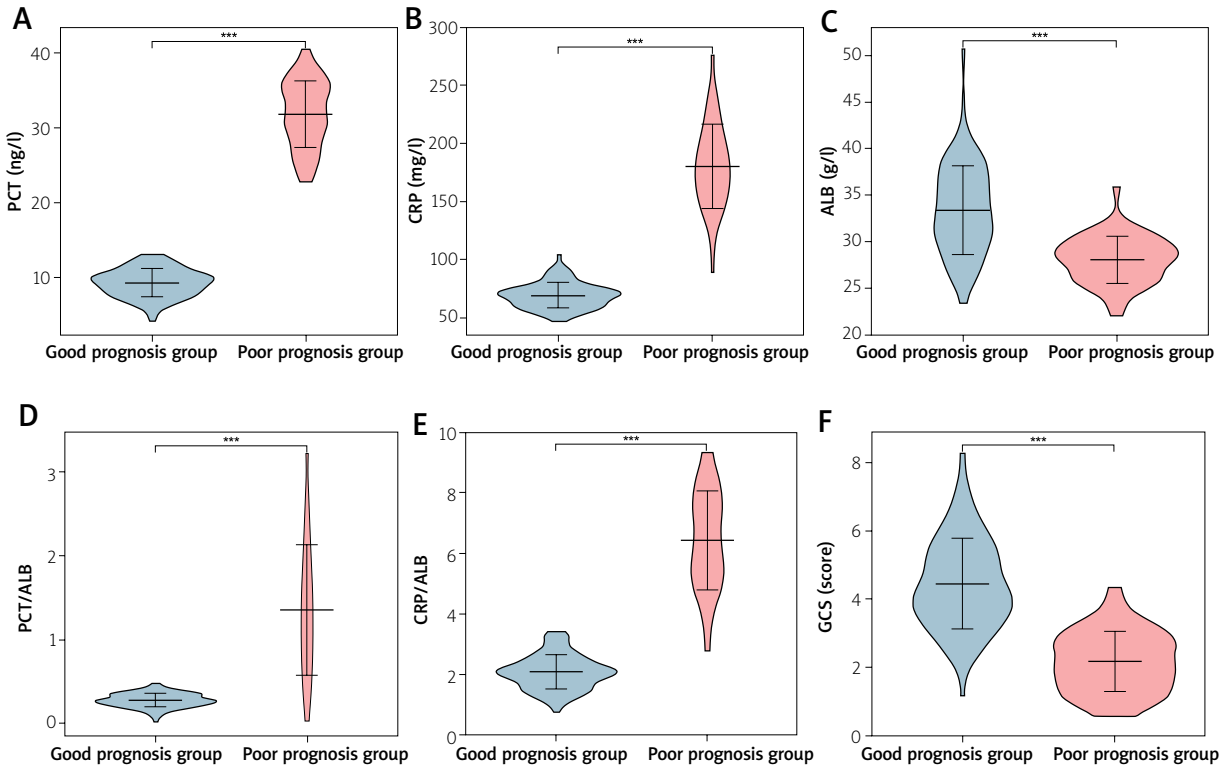

Fig. 3. Comparison of serum PCT/ALB and CRP/ALB ratios in patients with different prognosis. **A**) Comparison of PCT levels; **B**) Comparison of CRP levels; **C**) Comparison of ALB levels; **D**) Comparison of PCT/ALB levels; **E**) Comparison of CRP/ALB levels; **F**) Comparison of GCS levels. ***$p < 0.001$ compared between groups

Multivariate logistic regression analysis of prognosis in patients with CT

Multivariate logistic regression analysis demonstrated that PCT, CRP, and the ratios of PCT/ALB and CRP/ALB were risk factors and ALB was an independent protective factor for poor prognosis of CT patients ($p < 0.05$) (Table IV).

The value of PCT/ALB and CRP/ALB ratios in predicting the condition and prognosis of CT

ROC curve analysis showed that combined PCT/ALB and CRP/ALB ratios had an AUC of 0.883 and 0.860, respectively, to assess the severity and predict the prognosis in CT patients (Table V and Fig. 5).

Discussion

Craniocerebral trauma refers to the head and brain injury caused by external violence. Among the injuries of all parts of the body, the incidence is only second to that of the limbs, and the injuries are complex and serious. Due to the special physiological function of the brain, the disability and mortality rate of CT ranks first among all types of traumas. Although most patients survive after rescue and treatment, most of them suffer from different degrees of neurological dysfunction, such as consciousness, movement, sense, speech, cog-

Table III. Correlation analysis of PCT/ALB and CRP/ALB ratios with GCS score and GOS score

Indicators	GCS score		GOS score	
	r	*p*	*r*	*p*
PCT	–0.821	< 0.001	–0.636	< 0.001
CRP	–0.857	< 0.001	–0.628	< 0.001
ALB	0.381	< 0.001	0.413	< 0.001
PCT/ALB ratio	–0.750	< 0.001	–0.595	< 0.001
CRP/ALB ratio	–0.766	< 0.001	–0.628	< 0.001

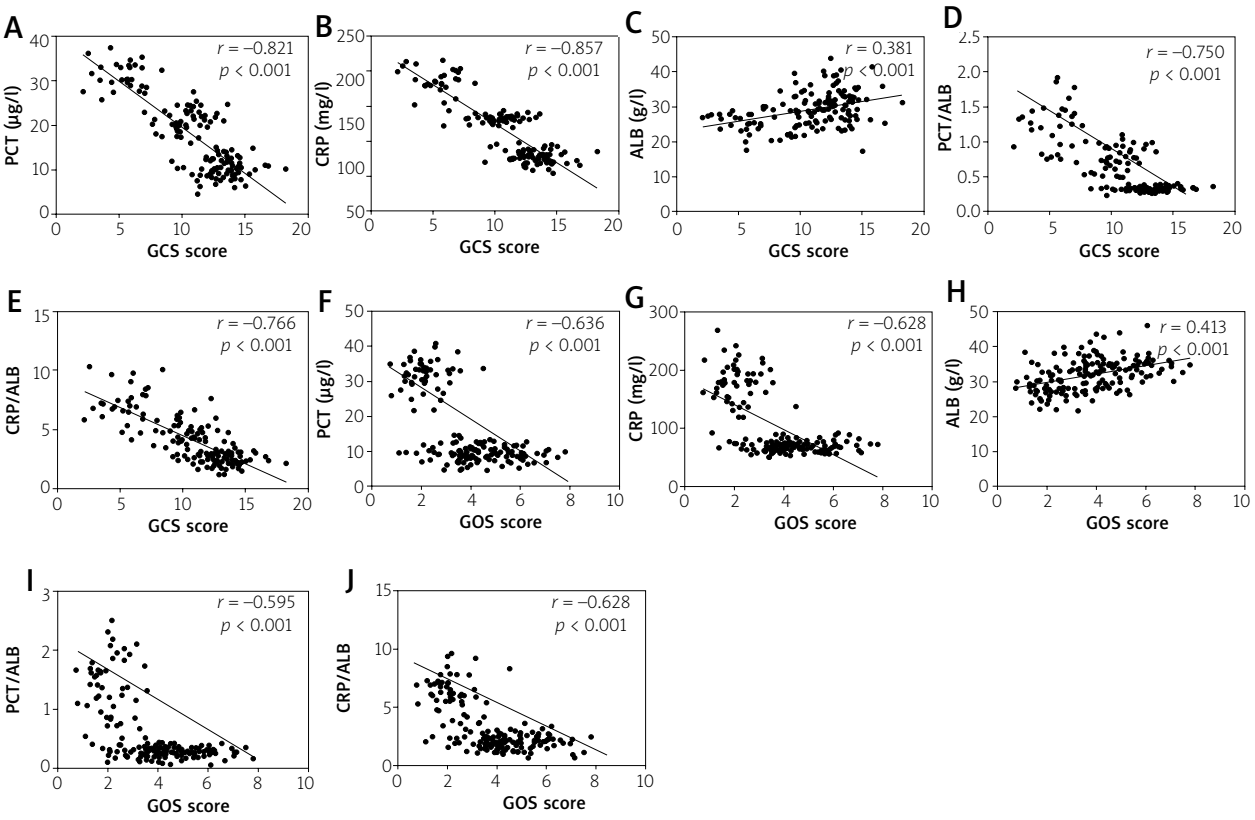

Fig. 4. Correlation analysis of PCT/ALB and CRP/ALB ratios with GCS score and GOS score. **A**) Correlation between GCS score and PCT; **B**) Correlation between GCS score and CRP; **C**) Correlation between GCS score and ALB; **D**) Correlation between GCS score and PCT/ALB; **E**) Correlation between GCS score and CRP/ALB; **F**) Correlation between GOS score and PCT; **G**) Correlation between GOS score and CRP; **H**) Correlation between GOS score and ALB; **I**) Correlation between GOS score and PCT/ALB; **J**) Correlation between GOS score and CRP/ALB.

nitive function, defecation and urination [32]. The mortality rate of CT has been largely decreased due to rapid development of medical research, and the overall level of diagnosis and treatment has been increased obviously. However, the prognosis of CT is poor, and most of the surviving patients suffer from nervous function injury, disturbance of consciousness, paralysis and other complications. The disability rate of CT is high, which not only increases the pain of patients, greatly affects their daily work and normal life, but also brings heavy medical and economic burden to families and society [19,22]. Early evaluation of the patient's condition and prediction of the patient's prognosis are important for the follow-up efficacy and improvement of the patient's prognosis.

Previous studies have found that there are extensive pro-inflammatory cytokines in human intracranial blood vessels and cells. When brain injury occurs, the

Table IV. Multivariate logistic regression analysis of prognosis in patients with CT

Indicators	β	SE	Wald	*P*	OR	95% CI
PCT	1.281	0.982	10.525	< 0.001	3.602	1.662~7.806
CRP	0.354	0.153	5.281	0.021	1.425	1.053~2.928
ALB	–0.286	1.426	3.996	0.035	0.062	0.003~0.958
PCT/ALB ratio	1.385	0.401	18.965	< 0.001	3.958	1.752-8.569
CRP/ALB ratio	1.512	0.438	21.635	< 0.001	4.156	1.895-9.451

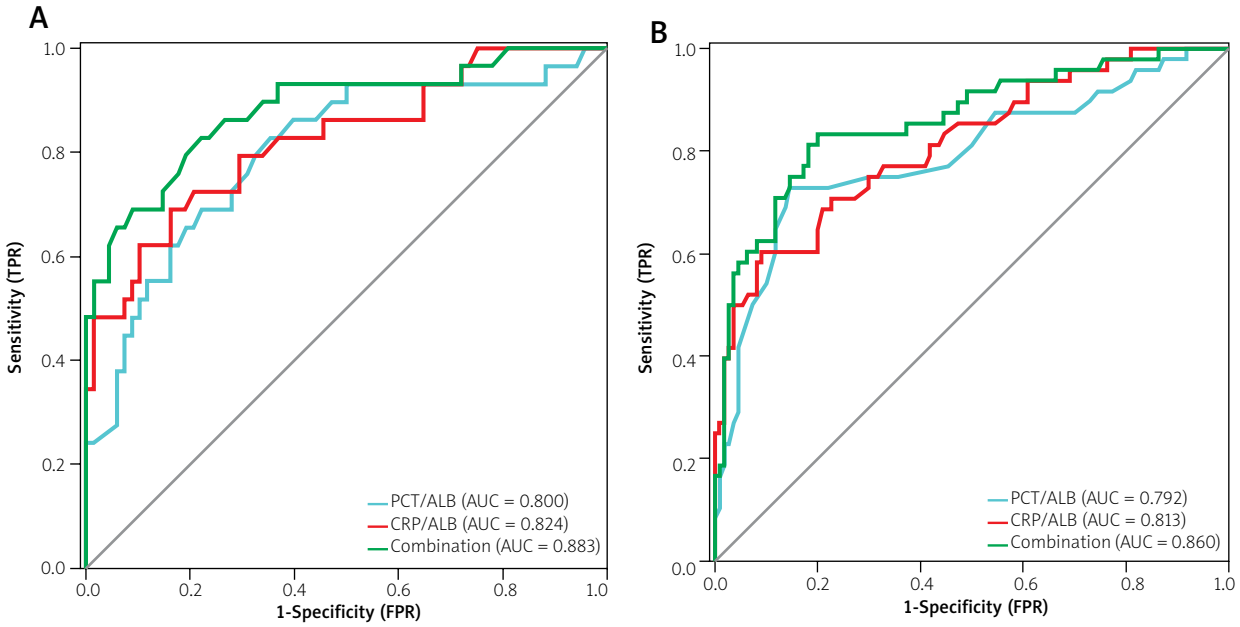

Fig. 5. The value of PCT/ALB and CRP/ALB ratios in predicting the condition and prognosis of CT. **A**) ROC curve of PCT/ALB and CRP/ALB ratios alone and jointly to predict the condition of craniocerebral trauma; **B**) ROC curve of PCT/ALB and CRP/ALB ratios alone and combined to predict the prognosis of craniocerebral trauma.

damage of the blood-brain barrier causes abundant inflammatory factors to enter the whole body with systemic circulation, activating the inflammatory cascade reaction, leading to systemic immunosuppression and infection, and aggravating the patient's condition [16,20]. Procalcitonin is the pre-peptide protein of calcitonin. Under the stimulation of bacterial infection, sepsis and severe trauma, various types of cells in different tissues in the body can induce the release of PCT, which a valuable serological marker for the identification and diagnosis of bacterial infection and the evaluation of prognosis [18]. During bacterial infection, serum PCT rises in the early stage, and it returns to the normal range faster than CRP after the infection is controlled. However, PCT is generally not elevated during local infection, so it is often used for the diagnosis and differential diagnosis of sepsis, as well as the assessment of the severity and progress of sepsis. The content of PCT is the symbol of the active degree of a systemic inflammatory reaction. The size and type of infected organs, the type of bacteria, the degree of inflammation and the status of immune response affect the content of PCT [28]. C-reactive protein is one of the early markers of inflammation, which is lowly expressed in the serum of the normal body. When the body is injured, the liver cells can be activated by a variety of factors to produce and secrete CRP, resulting in a sharp increase in the body CRP content. Therefore, the increase in the CRP level in patients can reflect the change of patients' condition [23]. In addition, CRP can be used for differential diagnosis of bacterial and viral infections. The CRP level increases when bacterial infection occurs, while CRP does not increase or slightly increases when viral infection occurs [27]. Therefore, CRP can help clinicians identify the type of infection, so as to give targeted drugs and treatment. Albumin is a common clin-

Table V. The value of PCT/ALB and CRP/ALB ratios in predicting the condition and prognosis of CT

Indicator		AUC	95% CI	*P* value	Sensitivity	Specificity	Youden index	Cut-off
Severity	PCT/ALB ratio	0.800	0.774-0.869	0.019	88.30%	60.00%	0.483	0.40
	CRP/ALB ratio	0.824	0.754-0.852	0.011	80.20%	62.20%	0.424	3.59
	Combined detection	0.883	0.821-0.926	0.005	90.50%	80.40%	0.709	–
Prognosis	PCT/ALB ratio	0.792	0.707~0.876	0.026	72.90%	85.50%	0.584	0.43
	CRP/ALB ratio	0.813	0.737~0.888	0.014	60.40%	90.90%	0.513	3.81
	Combined detection	0.860	0.792~0.927	0.008	83.30%	80.00%	0.633	–

ical nutritional status indicator, the content of which reflects the immune and inflammatory conditions of the body. When the immune function of the body is insufficient to control the inflammatory reaction, the level of ALB is extremely decreased [30]. In addition, ALB is sensitive to acute changes in the nutritional status, so it can be used as an indicator to evaluate and monitor the change in the nutritional status. By finding malnutrition in time and helping patients supplement nutrition, the patients could recover as soon as possible and the complications could be reduced [24]. PCT/ALB and CRP/ALB reflect the immune and inflammatory balance of the body. Some scholars [5] believe that the serum CRP/ALB level of elderly patients with femoral neck fracture was related to the degree of the postoperative infection 3 days after the operation, and early detection was helpful for the diagnosis of the postoperative infection. According to the study [4], PCT/ALB is an important indicator for predicting a septic shock, infection source and 28-day mortality, which has a certain reference value in clinical work.

In this experiment, the PCT/ALB and CRP/ALB ratios both increased with the aggravation of CT patients. PCT/ALB and CRP/ALB ratios had a negative correlation with GCS and GOS scores. At the same time, multivariate logistic regression analysis revealed that PCT/ALB and CRP/ALB ratios were both independent risk factors for poor prognosis of CT. These results suggested that the changes in PCT/ALB and CRP/ALB ratios affected the severity and prognosis of CT. As prognostic indicators for CT patients, PCT/ALB and CRP/ALB ratios not only reflect the nutritional status of patients, but also reflect the expression level of patient-specific or non-specific inflammatory reaction. Therefore, in clinical trials, PCT/ALB and CRP/ALB ratios may also be used as good indicators to evaluate the nutritional improvement therapy for severe patients. Similarly, previous studies believed that CRP/ALB levels could be used as laboratory indicators for early prediction of lung infection after severe CT surgery, which was conducive to early assessment of the degree of lung infection and the progress of the disease [14]. In addition, a previous study have found that the PCT/ALB ratio presents a high level in acute pancreatitis and is positively correlated with the severity of the disease. The increase in the PCT/ALB ratio indicates the aggravation of the patient's condition, which can be used as a biomarker to judge the severity of acute pancreatitis [29]. It can be seen from the above research results that combined PCT/ALB and CRP/ALB ratios reflect the level of acute inflammation and chronic nutritional status, which is of great significance in clinical evaluation.

At present, GCS score and GOS score are the main methods to evaluate the disease and predict the prognosis. However, the scale evaluation method will be affected by the subjectivity of doctors, and patients need to cooperate with the test, which has certain limitations [4,21]. Therefore, the focus is to find a laboratory index which can effectively detect the changes in the condition and predict the prognosis in patients with brain trauma. In this study, multivariate logistic regression analysis explicated that PCT/ALB and CRP/ALB ratios were risk factors for poor prognosis of CT. ROC curve analysis showed that the AUC of combined PCT/ALB and CRP/ALB ratios to evaluate the severity and the prognosis of CT patients was 0.883 and 0.860, respectively. A high level of PCT/ALB and CRP/ALB ratios reflects the aggravation and poor prognosis of CT patients. Thus, PCT/ALB and CRP/ALB ratios had a certain predictive value in predicting the condition and prognosis of CT patients, and the combined index had a higher predictive value. The study found that [15] the AUC of PCT/ALB predicting septic shock and 28-day mortality was 0.784 and 0.802, respectively, which was more accurate than the single index PCT or ALB. In addition, some studies have confirmed [9] that CRP/ALB is a powerful indicator of the prognosis of advanced pancreatic cancer. Baseline data and post-chemotherapy CRP/ALB could be used to predict the survival and evaluate the chemotherapy. Therefore, the above studies showed that the detection of PCT/ALB and CRP/ALB ratios in CT could help doctors formulate the therapeutic regime and improve the prognosis.

In general, PCT/ALB and CRP/ALB ratios had a positive correlation with the severity and prognosis of CT patients, and were risk factors for poor prognosis.

Early determination of changes in PCT/ALB and CRP/ALB ratios had a certain clinical value to assess the condition and prognosis. However, because of the limited study time and the fact that the subjects were all from the medical staff of our hospital, the results of the experiment may be accidental. In the future, the subjects and sources of the experiment will be expanded for further exploration.

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Disclosures

The study was approved by the Ethics Committee of Xuzhou Central Hospital (Approval No. XZXY-LK-20220214-008)

The authors report no conflict of interest.

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