C-reactive protein/albumin ratio level and its association with abdominal aortic aneurysm complicated with diabetes mellitus

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Introduction. Diabetes is a risk factor for abdominal aortic aneurysm (AAA), and C-reactive protein (CRP) and albumin (ALB) are both considered indicators of inflammation and nutritional status. The aim of this study was to evaluate the value of CRP/ALB ratio in AAA patients with diabetes.

Methods. A total of 800 patients with abdominal aortic aneurysm admitted to the Department of Vascular Surgery of the First Affiliated Hospital of Chengdu Medical College from 2019 to 2023 were collected and divided into a simple abdominal aortic aneurysm group (n=500 cases) and an abdominal aortic aneurysm combined with diabetes group (n=300). Depending on whether the patient has diabetes. Analyze clinical indicators before propensity score matching; compare the prognosis of the two groups after the same treatment (commonly used surgery-endovascular repair of abdominal aortic aneurysm) (ie, the survival curves of the two groups).

Results. The CRP/ALB ratio was significantly different between the two groups (P <0.001). The area under the ROC curve for the CRP/ALB ratio was 0.801 (95% CI: 0.7657-0.8363, P < 0.001), with an optimal cutoff of 0.299. In the multiple logistic regression model, the CRP/ALB ratio was an independent predictor of AAA diabetic complications (OR: 3.075, 95% CI: 1.185-2.969, P <0.001). The CRP/albumin ratio was strongly associated with surgical outcomes in patients with abdominal aortic aneurysm, with higher CRP/albumin ratios associated with shorter survival (P < 0.001).

Conclusions. CRP/ALB ratio can be used as a simple and useful predictor to identify patients with AAA and diabetes. CRP/ALB ratio is closely related to abdominal aortic aneurysm complicated with diabetes mellitus and can be used as a predictor. This simple yet useful metric can help clinicians better identify patients with AAA and diabetes, leading to better treatment and management planning.

Keywords. abdominal aortic aneurysm; Diabetes mellitus; CRA

INTRODUCTION

Abdominal aortic aneurysm (AAA) is a disease where the abdominal part of the aorta aneurysm expands locally [1]. The incidence of abdominal aortic aneurysms increases with age and is highest in men over 60 years of age. It is estimated to be 4-6 times more common in men than women. Among people over 60 years old, the incidence is about 2.2% in males and 0.5% in females [2-4]. Smoking is one of the leading risk factors, along with high blood pressure, high cholesterol, diabetes and family history. In addition, advanced age, obesity, chronic obstructive pulmonary disease, etc., may also increase the risk of developing AAA. Most abdominal aortic aneurysms have no symptoms, but if the tumor expands or ruptures, severe abdominal pain, low blood pressure, syncope and other symptoms may occur, and may even threaten life [5]. Quitting smoking, maintaining a healthy lifestyle and getting regular checkups can help prevent AAA. With the aging of the population, the prevalence of abdominal aortic aneurysm is also increasing. Therefore, we need to take aggressive prevention and treatment measures to curb its development.

Abdominal aortic aneurysm is a common aortic disease in which the abdominal aortic wall is locally dilated and weakened, leading to an increased risk of blood vessel rupture. Diabetes is a metabolic disease, and patients with diabetes have an increased risk of abdominal aortic aneurysm [6]. In recent years, many studies have focused on the correlation between abdominal aortic aneurysm and diabetes mellitus. Some studies have shown that diabetes can accelerate the development of abdominal aortic aneurysms, making them more severe and harder to treat. Patients with abdominal aortic aneurysm complicated with diabetes have a relatively poor prognosis, higher mortality, more complex disease, and more difficult to treat. Some studies suggest that early intervention can improve outcomes for such patients. Abdominal aortic aneurysms can worsen diabetes by affecting insulin production and utilization. For patients with abdominal aortic aneurysm complicated with diabetes, researchers are exploring more effective treatment strategies, such as using drugs, surgery and other methods to maintain blood sugar levels and control the progression of abdominal aortic aneurysm [7].

Overall, the research on abdominal aortic aneurysm combined with diabetes is continuing to deepen, and future research will help to better understand the relationship between the two and provide more precise guidance for clinical treatment. The research content of abdominal aortic aneurysm complicated with diabetes is relatively extensive, including risk factors, pathogenesis, treatment strategy and prognosis. Future studies will explore these issues more deeply and systematically, and provide more scientific and effective guidance for clinical treatment [8].

The CRP/ albumin ratio is the ratio of C-reactive protein (CRP) to albumin (Alb) in the blood and is often used to assess inflammation and nutritional status. In patients with abdominal aortic aneurysm complicated with diabetes, the level of CRP/ albumin ratio may be related to disease severity and prognosis [9]. Studies have shown that elevated CRP/ albumin ratios may indicate an increased risk of ruptured abdominal aortic aneurysms. People with diabetes often have higher levels of CRP/ albumin ratios, which may be due to a combination of inflammation and malnutrition. In addition, the increased CRP/ albumin ratio may also reflect the degree of inflammation and the deterioration of nutritional status in diabetic patients [10]. Therefore, monitoring the CRP/ albumin ratio in patients with abdominal aortic aneurysm combined with diabetes may be helpful in assessing severity and prognosis.

By controlling the onset of diabetes and improving nutritional status, it is possible to help reduce the level of CRP/ albumin ratio and reduce the risk of ruptured abdominal aortic aneurysms. At the same time, in clinical treatment, the condition and therapeutic effect can also be comprehensively evaluated in combination with other indicators [11-13]. The purpose of this study was to evaluate the value of CRP/ALB ratio in patients with AAA complicated with diabetes.

MATERIALS AND METHODS

Study population

We conducted a prospective study of patients admitted to the Department of vascular Surgery of the First Affiliated Hospital of Chengdu Medical College from January 1, 2019 to December 31, 2023 for diagnosis of abdominal aortic aneurysm. All patients met the criteria: clinical manifestations: abdominal pain, abdominal mass, pulse sensation tremor, abdominal distension. Imaging examination: Ultrasound, CT, MRI and other imaging examinations can clarify the size, shape, location and other information of the abdominal aortic aneurysm, and can also exclude other lesions. Angiography: In uncertain cases, angiography can provide a more definitive diagnosis. Arterial pressure measurement: By measuring the pressure changes in the abdominal aorta, it can help to determine the risk of abdominal aortic aneurysm and treatment options. In the end, a total of 800 patients were enrolled in our study. The diagnostic criteria for diabetes were based on the report of the Expert Committee on Diabetes Diagnosis and Classification. Patients were divided into diabetic group and non-diabetic group based on their previous medical history and blood test results of diabetes, all of which had abdominal aortic aneurysm. All patients received general clinical inquiry, laboratory examination and imaging examination.

Inclusion criteria: age usually over 40 years; Abdominal aortic aneurysms confirmed by medical imaging techniques such as ultrasound, CT scan, or MRI; Patients diagnosed with diabetes according to the diagnostic criteria of the International Diabetes Federation or the American Diabetes Association. Some studies may look specifically at patients with abdominal aortic aneurysms with diabetes. Exclusion criteria: patients with other vascular diseases, such as coronary heart disease, aneurysm, etc.; Patients with liver, kidney, immune system and other serious organ diseases; Patients with severe infections or inflammation such as pneumonia, tuberculosis; Patients taking steroids or non-steroidal anti-inflammatory drugs; A woman who is pregnant or nursing.

Laboratory test: All patients had rapid blood collection in the morning after fasting for 8 h, including fasting blood glucose (mmol/L), glycohemoglobin A1c (HbA1c, %), serum creatinine (mmol/L), D-D dimer (mg/L equivalent unit of fibrinogen), total cholesterol (mmol/L), triglyceride (mmol/L), high density lipoprotein (mmol/L), low density lipoprotein (mmol/L). Subsequently, HbA1c detection was performed using the NGSP certified method reported by HbA1c. All blood samples were taken for routine laboratory screening in the central laboratory of our hospital. Glucose meters are usually based on electrochemical measurement principles, using electrodes or optical sensors to measure glucose levels in the blood. High performance liquid chromatography (HPLC) usually uses column separation techniques to isolate HbA1c and other components. Enzymatic method is commonly used to determine creatinine in serum. The method is based on a process in which creatinase catalyzes the reaction of creatinine and ATP to produce creatine phosphate and adenosine diphosphate (ADP). Enzyme-linked immunosorbent assay (ELISA) is a commonly used immunological method that can be used to detect the level of D-D dimer in plasma: total cholesterol, triglycerides, HDL, LDL: these indicators are usually measured using chemical analytical methods such as chemiluminescence, enzyme, or colorimetry. The following instruments and equipment are commonly used for laboratory tests: Accu-Chek glucose meter, Waters High performance Liquid Chromatograph (HPLC), Abbott enzyme label meter, Sysmex hematology analyzer.

Endovascular repair was performed in all patients. The Endovascular Aneurysm (AAA) Repair is an endoscopic aneurysm and is also known as endovascular repair (EVAR). Compared with traditional open surgical repair, this type of surgery has less trauma and shorter recovery period. Endovascular prosthesis involves inserting a catheter with a stent through the femoral artery through a small incision after local anesthesia in the abdomen or groin and inserting the stent into the tumor. The stent will fully cover the location of the tumor and be fixed in the abdominal aorta. This will reduce the pressure on the tumor and prevent it from rupturing. The recovery period after surgery is short, and patients can usually go home within a few days, but long-term follow-up is required. After surgery, regular angiography or ultrasound is needed to ensure the stability of the stent and rule out complications such as stenosis or thrombosis.

Endovascular aneurysm repair is an interventional procedure usually performed using endoscopic techniques. The following are the general procedures and related parameters of this procedure: Anesthesia and analgesia: General anesthesia, or intraspinal anesthesia, is usually used. At the same time, adequate analgesic drugs should be given to relieve the patient's pain. Intubation: Scraping and disinfection through the surgical area is required before surgery. A catheter is then inserted into the patient's femoral artery and pushed into the aorta. Placement of an endovascular stent: An endovascular stent is advanced to the location of the aneurysm in a catheter guided by X-ray or other imaging technology. The stent will open and clamp the artery wall. After stent placement, the catheter was withdrawn and the incision was closed. The following parameters and variables should be controlled during the operation: Intra-arterial pressure: Intra-arterial pressure should be closely monitored during the operation to avoid stent rupture or internal leakage due to excessive expansion. Stent size: The size of the stent needs to be selected according to the size and shape of the patient's aneurysm. Stents that are too small may not be able to effectively clamp the artery wall, while stents that are too large may cause pressure on healthy arteries. Catheter insertion depth and Angle: The insertion depth and Angle must be controlled during intubation to ensure accurate insertion of the catheter into the aorta without damage to the artery wall. Stent Placement: The stent needs to be placed in an appropriate position to ensure smooth blood flow without causing pressure or damage to adjacent blood vessels and tissues. In conclusion, in the repair of intravascular aneurysm, patients' vital signs and parameters during the operation should be closely monitored to ensure the successful completion of the operation and avoid unnecessary complications.

Statistical analysis

We grouped patients according to the presence or absence of diabetes mellitus and studied the clinical role of CRA in abdominal aortic aneurysm. Propensity score matching analysis was used to analyze the differences in clinical indicators between the diabetic group and the non-diabetic group, and the Student's t test was used to compare the two groups. All experimental data were expressed as mean ± S.E.M. Logistic regression was used to analyze the prognostic factors, and Kaplan-Meier survival analysis was used to compare the survival curves of the two groups of patients. By comparing the survival curves of the two groups, it is possible to judge whether the difference in survival rate between the two groups is significant. The sensitivity and predictive value of CRA were predicted by the ROC curve, and P <0.05 was considered statistically significant. All statistical analyzes were performed by SPSS version 26 (SPSS, USA).

RESULTS

1. Clinical characteristics of study participants before propensity score matching.

Of the 800 enrolled patients with abdominal aortic aneurysm (400 males [50.0%]; 400 women (50.0%); Median (IQR) age, 56.00 years), 300 patients were diabetic (DM group) and 500 were non-diabetic (non-DM group). The average duration of DM in these 300 patients was 10.89 years. The clinical characteristics of the study population are shown in Table 1. There were no significant differences in gender, admission systolic blood pressure, diastolic blood pressure, serum creatinine, D-D dimer, total cholesterol, triglyceride, high density lipoprotein and low density lipoprotein between 2 groups (all $P>0.05$). We noted that diabetics were significantly older than non-diabetics (58.51 vs 49.24, $P<0.05$). However, it is worth mentioning that steroid drugs have glucose-raising effect, and the use of steroid drugs in a short period of time may have a great impact on fasting blood glucose. We did not include FBG in our subsequent analysis.

Table 1: Clinical characteristics of study participants before propensity score matching

Index	level	DM	Non_DM	*P*
n		300	500	
gender (%)	0	147 (49.0)	240 (48.0)	0.841
	1	153 (51.0)	260 (52.0)	
age [mean (SD)]		58.51 (15.56)	49.24 (13.10)	<0.001
Smoking_history (%)	0	180 (60.0)	320 (64.0)	0.291
	1	120 (40.0)	180 (36.0)	

Drinking_history (%)	0	219 (73.0)	340 (68.0)	0.158
	1	81 (27.0)	160 (32.0)	
Coronary_heart_disease (%)	0	225 (75.0)	399 (79.8)	0.134
	1	75 (25.0)	101 (20.2)	
Cerebral_infarction (%)	0	210 (70.0)	325 (65.0)	0.168
	1	90 (30.0)	175 (35.0)	
hypertension (%)	0	120 (40.0)	250 (50.0)	0.008
	1	180 (60.0)	250 (50.0)	
dyslipidaemia (%)	0	150 (50.0)	275 (55.0)	0.194
	1	150 (50.0)	225 (45.0)	
creatinine [mean (SD)]		88.36 (15.19)	90.13 (14.01)	0.093
Total_protein [mean (SD)]		72.28 (10.05)	75.34 (9.19)	<0.001
albumin [mean (SD)]		41.74 (4.81)	48.08 (4.78)	<0.001
TBA [mean (SD)]		11.31 (2.28)	10.21 (2.46)	<0.001
Blood_urea_nitrogen [mean (SD)]		16.29 (5.39)	15.62 (4.56)	0.059
Scr [mean (SD)]		90.52 (10.53)	91.27 (9.79)	0.308
Total_bilirubin [mean (SD)]		0.90 (0.31)	0.82 (0.21)	<0.001
Indirect_bilirubin [mean (SD)]		0.49 (0.10)	0.40 (0.10)	<0.001
triglyceride [mean (SD)]		1.60 (0.41)	1.69 (0.48)	0.011
HDL [mean (SD)]		1.30 (0.21)	1.20 (0.10)	<0.001
LDL [mean (SD)]		2.98 (0.78)	3.02 (0.70)	0.387
Total_cholesterol [mean (SD)]		5.28 (0.99)	5.19 (1.13)	0.29
sodium [mean (SD)]		138.07 (3.30)	141.24 (2.89)	<0.001
potassium [mean (SD)]		4.18 (0.54)	4.27 (0.39)	0.006
WBC [mean (SD)]		7.99 (2.05)	7.04 (1.76)	<0.001
neutrophil [mean (SD)]		71.49 (11.00)	68.24 (8.07)	<0.001
lymphocyte [mean (SD)]		33.45 (2.26)	31.52 (3.67)	<0.001
hemoglobin [mean (SD)]		130.94 (20.17)	144.58 (22.07)	<0.001
Erythrocyte distribution width [mean (SD)]		12.78 (0.60)	13.21 (0.58)	<0.001
platelets [mean (SD)]		240.00 (48.66)	260.99 (49.23)	<0.001
CRP [mean (SD)]		15.09 (3.12)	12.20 (4.74)	<0.001
D_D_dimer [mean (SD)]		0.59 (0.19)	0.60 (0.20)	0.377
Aneurysm_diameter [mean (SD)]		5.15 (0.99)	4.83 (1.14)	<0.001
CRA [mean (SD)]		0.37 (0.09)	0.26 (0.10)	<0.001

2. Pathogenic Features in the Matched Data Set After PSM Using "Age" as the Predictor.

Taking into account significant differences in age, we performed PSM and here used "age" as a predictor to correct for potential bias to further explore pathogenic characteristics between the two groups, focusing on CRA levels in both groups. After PSM, 26 patients were matched successfully (Table 2). It should be noted that after

PSM, CRA level、CRP、D-D dimer, Aneurysm diameter (cm) in DM group was still significantly higher than that in non-DM group, P < 0.05 (table 2)

Table 1: Baseline characteristics

	level	DM	Non_DM	*P*
n		300	300	
gender (%)	0	147 (49.0)	144 (48.0)	0.87
	1	153 (51.0)	156 (52.0)	
age [mean (SD)]		58.51 (15.56)	55.31 (12.31)	0.005
Smoking_history (%)	0	180 (60.0)	195 (65.0)	0.238
	1	120 (40.0)	105 (35.0)	
Drinking_history (%)	0	219 (73.0)	208 (69.3)	0.367
	1	81 (27.0)	92 (30.7)	
Coronary_heart_disease (%)	0	225 (75.0)	237 (79.0)	0.286
	1	75 (25.0)	63 (21.0)	
Cerebral_infarction (%)	0	210 (70.0)	188 (62.7)	0.07
	1	90 (30.0)	112 (37.3)	
hypertension (%)	0	120 (40.0)	153 (51.0)	0.009
	1	180 (60.0)	147 (49.0)	
dyslipidaemia (%)	0	150 (50.0)	164 (54.7)	0.288
	1	150 (50.0)	136 (45.3)	
creatinine [mean (SD)]		88.36 (15.19)	90.37 (14.31)	0.095
Total_protein [mean (SD)]		72.28 (10.05)	75.28 (8.99)	<0.001
albumin [mean (SD)]		41.74 (4.81)	48.32 (4.80)	<0.001
TBA [mean (SD)]		11.31 (2.28)	10.18 (2.44)	<0.001
Blood_urea_nitrogen [mean (SD)]		16.29 (5.39)	15.59 (4.43)	0.08
Scr [mean (SD)]		90.52 (10.53)	91.87 (9.79)	0.103
Total_bilirubin [mean (SD)]		0.90 (0.31)	0.81 (0.21)	<0.001
Indirect_bilirubin [mean (SD)]		0.49 (0.10)	0.40 (0.09)	<0.001
triglyceride [mean (SD)]		1.60 (0.41)	1.70 (0.49)	0.01
HDL [mean (SD)]		1.30 (0.21)	1.21 (0.10)	<0.001
LDL [mean (SD)]		2.98 (0.78)	3.02 (0.69)	0.419
Total_cholesterol [mean (SD)]		5.28 (0.99)	5.17 (1.08)	0.204
sodium [mean (SD)]		138.07 (3.30)	141.25 (2.94)	<0.001
potassium [mean (SD)]		4.18 (0.54)	4.27 (0.40)	0.017
WBC [mean (SD)]		7.99 (2.05)	7.01 (1.72)	<0.001
neutrophil [mean (SD)]		71.49 (11.00)	68.08 (8.25)	<0.001

lymphocyte [mean (SD)]		33.45 (2.26)	31.46 (3.61)	<0.001
hemoglobin [mean (SD)]		130.94 (20.17)	145.77 (22.80)	<0.001
Erythrocyte distribution width [mean (SD)]		12.78 (0.60)	13.23 (0.55)	<0.001
platelets [mean (SD)]		240.00 (48.66)	263.61 (50.09)	<0.001
CRP [mean (SD)]		15.09 (3.12)	12.15 (4.86)	<0.001
D-D dimer [mean (SD)]		0.59 (0.19)	0.60 (0.21)	0.364
Aneurysm diameter [mean (SD)]		5.15 (0.99)	4.78 (1.17)	<0.001
CRA [mean (SD)]		0.37 (0.09)	0.25 (0.10)	<0.001

3.CRA is an independent risk factor for predicting diabetes associated with abdominal aortic aneurysm and has a strong sensitivity.

Since CRA is significantly increased in patients with abdominal aortic aneurysm, we speculate that CRA may be related to secondary diabetes of abdominal aortic aneurysm, and may be a risk factor for secondary diabetes of abdominal aortic aneurysm, which has important clinical diagnostic value in predicting secondary diabetes of abdominal aortic aneurysm. The result was as expected. The area under the ROC curve for the CRP/ALB ratio was 0.801 (95%CI: 0.701-0.871, *P* <0.001) (Figure 1), and the optimal critical value was 0.299. In multiple logistic regression models, CRP/ALB ratio was an independent predictor of AAA combined diabetes complications (OR: 3.075, 95% CI: 1.185-2.969, *P* <0.001) (Table 3).

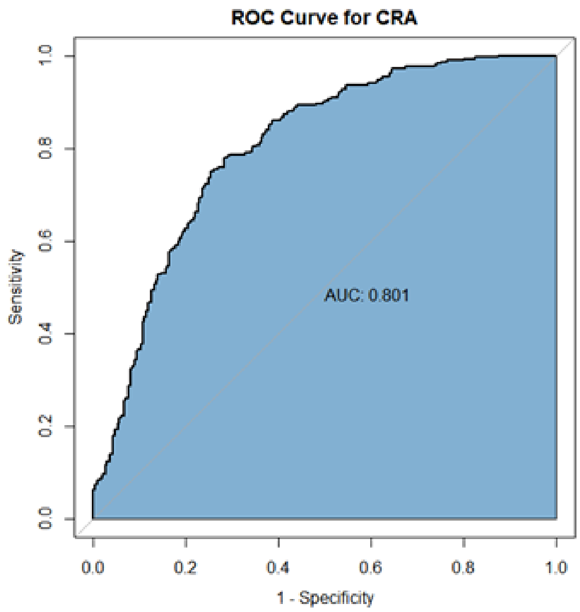

Figure 1 ROC of Test

Table 3: CRAs are independent risk factors

term	OR	CI lower	CI upper	*P*
(Intercept)	0.004	0.001	0.016	0.388

Aneurysm diameter	1.434	1.197	1.718	0.923
D-D dimer	0.613	0.232	1.619	0.851
CRP/ALB ratio	3.075	1.185	2.969	0.001

4. CRA is closely related to the surgical prognosis of patients with abdominal aortic aneurysm

The correlation between CRA and postoperative survival of patients with abdominal aortic aneurysm was further studied. Kaplan-Meier survival analysis was used to draw the generation curve, and the median CRA was 0.294. CRP/ albumin ratio was closely associated with surgical outcome in patients with abdominal aortic aneurysm, and higher CRP/ albumin ratio was associated with shorter survival (*P* <0.001)（Figure 2）.

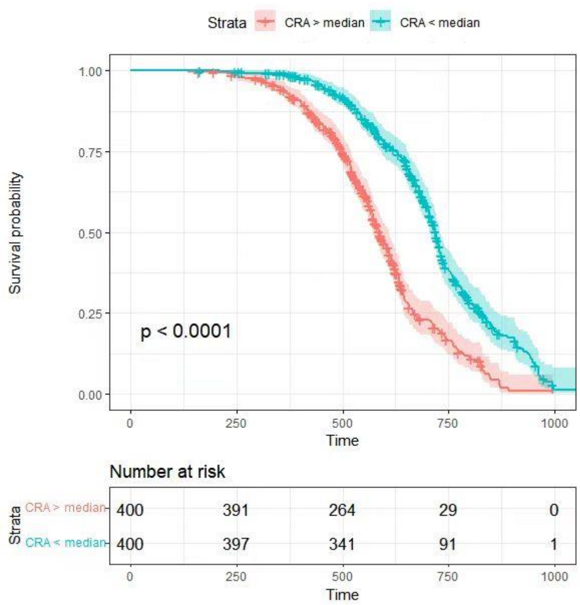

Figure 2

DISCUSSION

AAA is a disease where the aorta aneurysm expands locally in the abdomen. Diabetes is a metabolic disease characterized by insufficient insulin secretion or weakened cellular response to insulin, resulting in elevated blood sugar [14-15]. Both diabetes and abdominal aortic aneurysm are common diseases, and there is a correlation between the two. Current research suggests that diabetics have a higher risk of developing abdominal aortic aneurysms than non-diabetics. There is also a higher incidence of diabetes in patients with abdominal aortic aneurysm. This correlation may be due to the close relationship between diabetes and the occurrence and development of cardiovascular diseases such as arteriosclerosis, which is one of the main causes of the formation of abdominal aortic aneurysm [16]. In addition, some studies have found that the diabetes risk of patients with abdominal aortic aneurysm is related to the diameter of abdominal aortic aneurysm [17]. The results showed that the larger the diameter of the abdominal aortic aneurysm, the higher the incidence of diabetes. The relationship between diabetes mellitus and abdominal aortic aneurysm is complex and needs more research. In addition, several studies have looked at the interplay between diabetes and the treatment of abdominal aortic aneurysms. Patients with diabetes who undergo surgery for abdominal aortic aneurysms may be able to improve their diabetes, research suggests. This may be due to surgical treatment that improves abdominal hemodynamics and reduces blood sugar levels and glycosylated hemoglobin levels. However, surgical treatment may also have a negative impact on the condition of patients with diabetes, such as blood sugar fluctuations and insulin resistance after surgery. Therefore, for the treatment of patients with abdominal aortic aneurysm complicated with diabetes, it is necessary to comprehensively consider the condition and treatment plan of diabetes and abdominal aortic aneurysm, and develop an individualized treatment plan. In general, the research status of abdominal aortic aneurysm complicated with diabetes is still in the stage of continuous development, and the relationship between the two and the treatment plan need to be further explored [18]. At the same time, for diabetics with abdominal aortic aneurysm, attention should be paid to regular abdominal ultrasonography and control of blood sugar levels to reduce the risk of complications.

Current studies have shown that the increased CRP/ albumin ratio is associated with the development of abdominal aortic aneurysm (AAA) and type 2 diabetes (T2DM), possibly because the increased ratio reflects inflammation and malnutrition, which leads to the disturbance of glucose metabolism, and thus increases the risk of AAA and T2DM.Specifically, the ratio of CRP, an indicator of inflammation, and albumin, an indicator of nutrition, can reflect the combination of inflammation and nutrition. However, T2DM patients are often accompanied by chronic inflammation, including low-grade chronic inflammation and autoimmune inflammation, which can lead to insulin resistance and abnormal glucose metabolism, increasing the risk of T2DM and AAA. Currently, the treatment of patients with AAA and T2DM for inflammation and malnutrition caused by elevated CRP/ albumin ratio mainly includes the following aspects: for T2DM patients, blood glucose levels need to be controlled, and insulin resistance and abnormal glucose metabolism need to be managed through diet and medication to reduce the occurrence of inflammatory response. For malnourished patients, appropriate diet and nutritional supplements are needed to improve the nutritional status and reduce the occurrence of inflammation. For the inflammatory response of patients, anti-inflammatory drugs can be used to control the occurrence of inflammatory reaction and reduce the damage to the body. In conclusion, the inflammatory and nutritional conditions associated with elevated CRP/ albumin ratios require a comprehensive approach, including improved nutritional status, management of insulin resistance and abnormal glucose metabolism, and control of inflammatory responses.

Some studies have shown that CRP/ albumin ratio can be used as an indicator to evaluate the level of inflammation and severity of disease in AAA patients [19]. The study found that CRP/ albumin ratio can predict the expansion rate of AAA and the need for surgical intervention, which has certain clinical value. The study also found that the CRP/ albumin ratio in AAA patients was positively correlated with the risk of AAA rupture. Diabetes is one of the common complications in patients with AAA, and the CRP/ albumin ratio may be related to the occurrence and progression of diabetes. AAA patients have a higher prevalence of diabetes and a higher CRP/ albumin ratio [20]. In addition, the study found a positive correlation between CRP/ albumin ratio and the development of diabetes. In general, current research results indicate that CRP/ albumin ratio may be one of the important indicators for evaluating the disease condition and predicting disease progression in AAA patients, and is also associated with the occurrence and development of diabetes [21]. However, due to the limited number of studies and conflicting results, more research is needed to confirm these findings and explore the specific role of CRP/ albumin ratio in the pathogenesis of AAA and diabetes.

Our results further clarified the clinical value of CRA in patients with abdominal aortic aneurysm and diabetes, and the CRP/ALB ratio was significantly different between the two groups ($P < 0.001$). The area under ROC curve for CRP/ALB ratio was 0.801 (95% CI: 0.701-0.871, $P < 0.001$), and the optimal cutoff was 0.299. In multiple logistic regression models, the CRP/ALB ratio was an independent predictor of AAA complications with diabetes (OR: 3.075, 95% CI: 1.185-2.969, $P < 0.001$). CRP/ albumin ratio was closely associated with surgical outcome in patients with abdominal aortic aneurysm, and higher CRP/ albumin ratio was associated with shorter survival ($P < 0.001$). The CRP/ albumin ratio is an indicator of inflammatory status and may be associated with the onset and progression of AAA and diabetes, as well as with postoperative survival. This study still has some limitations, it should be a multi-center study, and the level of surgeons should be consistent.

CONCLUSION

The CRP/ albumin ratio, a measure of inflammation status, is clinically important in patients with diabetes associated with AAA. The CRP/ albumin ratio is promising for clinical use in patients with AAA with concurrent diabetes as a marker for assessing disease inflammatory status, disease severity, surgical risk, and prognosis.

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FIGURE LEGEND

Figure 1: CRA is an independent risk factor for predicting diabetes associated with abdominal aortic aneurysm and has a strong sensitivity.

Figure2: CRA is closely related to the surgical prognosis of patients with abdominal aortic aneurysm.

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