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Clinical Study of FGF8 as a Biomarker in Sepsis

Yanting Ruan, Yao Chen, Huali Ran, Fang Wang, Ran Pu, Rongrui Tang*

Shapingba Hospital affiliated to Chongqing University (Shapingba District People's Hospital of Chongqing), Chongqing 400030, China

***Corresponding author**: Rongrui Tang, tangrongrui007@outlook.com

Abstract: *Objective*: To explore the application and predictive value of FGF8 as a biomarker in sepsis. *Methods*: A total of 44 patients with sepsis who were diagnosed and treated in our hospital from December 2024 to February 2026 were selected as the study subjects, and another 44 volunteers who underwent health check-ups in our hospital during the same period were selected as the control group. Clinical data and levels of FGF8, procalcitonin (PCT), C-reactive protein (CRP), white blood cell count (WBC), red blood cell count (RBC), hemoglobin (Hb), and platelet (PLT) in peripheral venous blood were collected from both groups. Univariate analysis was performed, and variables with statistical significance in the univariate analysis were included in the multivariate logistic regression analysis. ROC curves were plotted to explore the predictive value of FGF8 as a biomarker in sepsis. *Results*: Univariate analysis revealed that APACHE II score, SOFA score, FGF8 level, and PLT were statistically significant. After inclusion in the multivariate logistic regression analysis, APACHE II score, SOFA score, and FGF8 level were positively correlated with sepsis, while PLT was negatively correlated with sepsis. Subsequent ROC curve plotting showed that FGF8 had a sensitivity of 82.67%, a specificity of 78.50%, and an AUC of 0.840 in sepsis, indicating certain predictive value. *Conclusion*: FGF8, as a biomarker, has certain predictive value in sepsis, providing a potential new candidate marker for the auxiliary diagnosis of sepsis, which deserves clinical attention.

Keywords: FGF8; Biomarker; Sepsis; Clinical application; Predictive value

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1. Introduction

Sepsis, a life-threatening organ dysfunction syndrome caused by the host's dysregulated response to infection, has become one of the leading causes of death in intensive care unit (ICU) patients worldwide. Epidemiological studies have found that nearly 50 million new cases of sepsis occur globally each year, with a mortality rate of 20% [1]. Despite significant advances in early identification, fluid resuscitation, anti-infective therapy, and organ function support in recent years, the mortality rate of sepsis remains high. FGF8, a member of the fibroblast growth factor (FGF) family with 23 members, binds to FGF receptors and regulates cell proliferation, differentiation, migration, and survival [2]. FGF8 plays a crucial role in embryonic

development, participating in neural crest cell migration, organogenesis, and tissue repair. Recent studies have found that FGF8 not only has angiogenic and neuroprotective functions but also participates in immune regulation and inflammatory responses [3]. The core pathophysiology of sepsis is the host's uncontrolled inflammatory response to infection, leading to multiple organ dysfunction. This process involves multiple links, including immune cell activation, inflammatory cytokine release, coagulation system activation, and microcirculation disorders. By regulating the function of macrophages and neutrophils, it inhibits excessive inflammatory responses [4]. However, the clinical value of FGF8 in sepsis remains unclear. Based on this, this study selected patients with sepsis diagnosed and treated in our hospital from December 2024 to February 2026 as the study subjects and selected volunteers who underwent health check-ups in our hospital during the same period as the control group to explore the predictive value of FGF8 in sepsis. The specific report is as follows.

2. Materials and methods

2.1. General information

A total of 44 patients with sepsis diagnosed and treated in our hospital from December 2024 to February 2026 were selected as the case group, and another 45 volunteers who underwent health check-ups in our hospital during the same period were selected as the control group.

2.1.1. Inclusion criteria

(1) Diagnosed with sepsis by our hospital;
(2) Age > 18 years;
(3) Complete clinical data;
(4) Hospitalized in the ICU;
(5) High treatment compliance of patients;
(6) Patients and their families signed informed consent forms.

2.1.2. Exclusion criteria

(1) Complicated with other malignancies;
(2) Complicated with autoimmune diseases;
(3) Complicated with liver and kidney dysfunction;
(4) Pregnant women;
(5) Users of immunosuppressive agents.

2.2. Methods

2.2.1. Research methods

In this study, patients with sepsis were used as the case group, and healthy volunteers were used as the control group.

Clinical data and peripheral venous blood indicators were selected as independent variables. Clinical data included patient gender, age, heart rate, respiratory rate, blood pressure, arterial oxygen saturation, mental state, Acute Physiology and Chronic Health Evaluation II (APACHE II) score, and Sequential Organ Failure Assessment (SOFA) score.

Peripheral blood indicators included FGF8 level, PCT, CRP, WBC, RBC, Hb, and PLT.

2.2.2. ELISA detection of FGF8

The expression level of FGF8 was detected by enzyme-linked immunosorbent assay (ELISA), with the following specific steps:

(1) Coat specific antibodies on the enzyme-labeled plate to form solid-phase antibodies;
(2) Add the sample to be tested, and the FGF8 in the sample binds to the solid-phase antibodies;
(3) Add biotinylated anti-FGF8 antibodies to form immune complexes with the bound FGF8;
(4) Add horseradish peroxidase-labeled avidin to bind to the biotinylated antibodies;
(5) Add TMB substrate for color development, with the color intensity proportional to the FGF8 concentration;
(6) Add stop solution to terminate the reaction buffer, and measure the absorbance value using an enzyme-labeled instrument [5].

2.3. Statistical methods

The results of this study were analyzed using SPSS 25.0 statistical software. Measurement data were expressed as (mean ± standard deviation) or median and interquartile range {M (QR)}. Comparisons within groups were performed using *t*-tests or Mann-Whitney U tests. Categorical data were expressed as percentages, and comparisons between groups were performed using the χ^2 test. Multivariate logistic analysis was performed, and ROC curves were plotted to explore the predictive value of FGF8 as a biomarker in sepsis.

3.Results

3.1. Univariate analysis results

In this study, 44 cases were included in both the case group and the control group. Univariate analysis revealed that APACHE II score, SOFA score, FGF8 level, and PLT were statistically significant, while other variables were not statistically significant in the univariate analysis ($p > 0.05$), as shown in **Table 1**.

Table 1. Univariate analysis results

Variable	Category	Control group(n = 44)	Case group(n = 44)	χ^2/t	*p*
Gender (%)	Male (n = 47)	24	23	0.046	0.831
	Female (n = 41)	20	21		
Age (years)	Mean	52.41 ± 8.85	53.10 ± 9.03	0.362	0.718
Heart rate (beats/min)	Mean	85.19 ± 7.79	87.21 ± 7.82	1.214	0.228
Respiratory rate (breaths/min)	Mean	17.22 ± 3.06	17.67 ± 3.25	0.669	0.506
Diastolic blood pressure (mmHg)	Mean	82.19 ± 6.28	84.03 ± 6.23	1.380	0.171
Systolic blood pressure (mmHg)	Mean	135.25 ± 10.21	136.92 ± 10.34	0.762	0.448
Arterial oxygen saturation (%)	Mean	98.12 ± 1.05	97.82 ± 1.02	1.359	0.178
Mental status (%)	Normal (n = 81)	42	39	1.397	0.237
	Abnormal (n = 7)	2	5		
APACHE II score	Mean	13.25 ± 1.16	17.47 ± 1.29	16.135	< 0.001
SOFA score	Mean	1.27 ± 0.21	6.84 ± 1.01	35.815	< 0.001
FGF8 level	Mean	23.84 ± 3.56	69.50 ± 6.39	41.406	< 0.001
PCT (ng/mL)	Mean	0.07 ± 0.01	0.13 ± 0.02	17.799	< 0.001
CRP (mg/L)	Mean	8.95 ± 1.23	9.31 ± 1.35	1.308	0.195

Variable	Category	Control group(n = 44)	Case group(n = 44)	χ^2/t	p
WBC ($\times 10^9$/L)	Mean	9.04 ± 1.07	9.21 ± 1.05	0.752	0.454
RBC ($\times 10^{12}$/L)	Mean	5.13 ± 0.84	5.36 ± 0.92	1.225	0.224
Hb (g/L)	Mean	156.85 ± 13.34	161.21 ± 12.99	1.553	0.124
PLT ($\times 10^9$/L)	Mean	297.26 ± 15.64	301.27 ± 12.60	1.324	0.189

3.2. Multifactorial logistic regression analysis

Variables that demonstrated statistical significance in the aforementioned univariate analysis were included in the multifactorial logistic regression analysis. Four variables were incorporated: APACHE II score, SOFA score, FGF8 level, and PLT. The analysis revealed that the APACHE II score (OR = 2.140, 95% CI: 1.889–2.408), SOFA score (OR = 2.469, 95% CI: 2.055–2.833), and FGF8 level (OR = 2.812, 95% CI: 2.347–3.226) were positively correlated with sepsis, while PLT (OR = 0.651, 95% CI: 0.448–0.769) was negatively correlated with sepsis, as detailed in **Table 2**.

Table 2. Multifactorial logistic regression analysis

Variable	β	S.E	p	OR	95% CI
APACHE II score	0.84	0.81	< 0.05	2.140	1.889–2.408
SOFA score	0.89	0.88	< 0.05	2.469	2.055–2.833
FGF8 level	0.93	0.90	< 0.05	2.812	2.347–3.226
PLT	0.64	0.61	< 0.05	0.651	0.448–0.769

3.3. Predictive value analysis

Based on the results of the multifactorial logistic regression analysis, an ROC curve was plotted. FGF8 demonstrated a sensitivity of 82.67% and a specificity of 78.50% for sepsis, with an AUC of 0.840, which was higher than that of other indicators, indicating a superior predictive value. The details are shown in **Figure 1**.

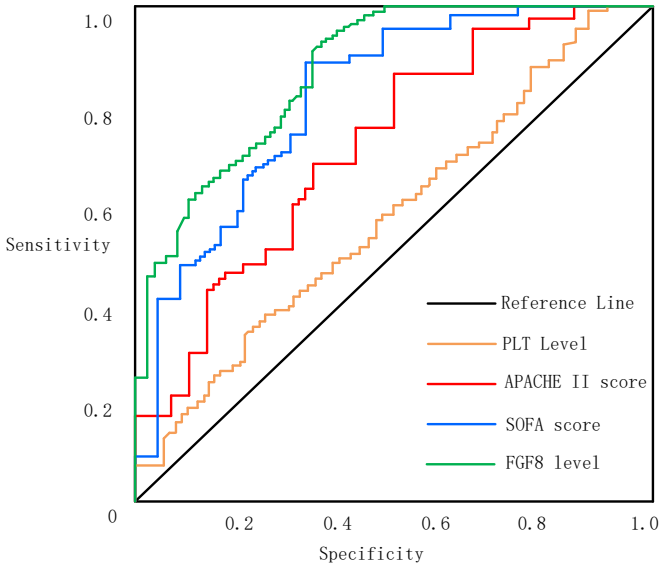

Figure 1. ROC curve of FGF8 expression level in predicting the value of sepsis.

4. Discussion

Sepsis is a common clinical condition characterized by organ dysfunction, with both high incidence and mortality rates, which is detrimental to favorable patient prognosis [6]. Early identification of sepsis is crucial for promoting favorable patient outcomes. However, at present, clinical diagnosis of sepsis still relies on clinical manifestations and laboratory tests, lacking biomarkers with high specificity [7]. Therefore, there is an urgent clinical need for biomarkers with both high sensitivity and specificity. Fibroblast growth factor 8 (FGF8), a member of the FGF family, possesses various biological activities. Related studies have indicated that FGF8 is closely associated with the prognosis of sepsis, although the specific mechanism remains unclear [8]. In addition to serving as a biomarker, FGF8 also exhibits certain immunomodulatory effects. It significantly enhances the phagocytic and bactericidal capabilities of macrophages against bacteria through the FGFR1 pathway, thereby strengthening the host's anti-infective immune defense [9]. Furthermore, FGF8 can increase the autophagy levels in the lung and intestinal tissues of septic mice while inhibiting tissue cell apoptosis, thereby reducing tissue damage and improving the survival rate of septic mice. These findings provide a theoretical basis for the potential application of FGF8 in sepsis treatment. By administering exogenous recombinant FGF8 protein or upregulating endogenous FGF8 expression, it may be possible to improve the immune status of sepsis patients, reduce tissue damage, and enhance survival rates [10].

Based on this, the present study explored the application and predictive value of FGF8 as a biomarker in sepsis. Sepsis patients and healthy volunteers were enrolled, and univariate analysis revealed that the APACHE II score, SOFA score, FGF8 level, and PLT were statistically significant ($p < 0.05$), suggesting that these factors could serve as independent predictors of sepsis. Subsequently, these factors were included in a multifactorial logistic regression analysis, which found that the APACHE II score, SOFA score, and FGF8 level were positively correlated with sepsis, while PLT was negatively correlated with sepsis. This indicates that as the APACHE II score, SOFA score, and FGF8 level increase, and PLT decreases, the incidence of sepsis rises. After plotting the ROC curve, it was found that FGF8 had a sensitivity of 82.67%, a specificity of 78.50%, and an AUC of 0.840 for sepsis, indicating a high predictive value.

5. Conclusion

In summary, FGF8, as a biomarker, has certain predictive value in sepsis, providing a potential novel candidate marker for the auxiliary diagnosis of sepsis, which warrants clinical attention.

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Disclosure statement

The authors declare no conflict of interest.

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