RESEARCH ARTICLE | JANUARY 10 2019

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AIP Conf. Proc. 2058, 020033 (2019)
https://doi.org/10.1063/1.5085546

Study and Analyze the Correlation between the Prognosis of Pulmonary Surfactant Protein A and Community-Acquired Pneumonia

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Abstract. Objective to discuss the correlation between the prognosis of pulmonary surfactant protein A (SP-A) and community-acquired pneumonia (CAP). Methods 100 CAP patients, from August 2013 to September 2014, were selected randomly. According CURB-65 evaluative criteria, patients were divided into mild group, moderate group and severe group respectively; In accordance with the criteria of CAP critical rating 7, patients were divided into low, intermediate, high and extremely high risk groups. The differences on the clinical prognostic indicators (hospital stays, mechanical ventilation and oxygenation index) through comparisons among groups. Results SP-A content and oxygenation index for patients between moderate and severe groups were significantly less than those in mild group ($P < 0.05$), while the hospital stays and mechanical ventilation were distinctly larger than those in mild group ($P < 0.05$). The SP-A content and oxygenation index of patients among intermediate, high and extremely high risk groups were significantly less than those in low-risk group ($P < 0.05$), while the hospital stays and mechanical ventilation were remarkably larger than those in low-risk group ($P < 0.05$). Conclusion SP-A, a sensitive and accurate biological specific indicator, shows a crucial evaluation value on the disease severity and prognosis of CAP.

Key words: Pulmonary surfactant protein A; Community-acquired pneumonia; Prognosis.

INTRODUCTION

Community-acquired pneumonia (CAP) is a common infectious disease with the harm to people's health. Although the diagnostic techniques are improved continuously, the antibiotic therapy is performed and preventive measures are extensively implemented, the morbidity and mortality of CAP are still high. CAP is one of the main reasons leading to patients' death 1-2. Recently, Accurate CAP condition evaluation method is of scarcity and deficiency on disease evaluation of CAP high-risk patients is one of the main reasons to induce the high mortality of CAP. Pulmonary surfactant protein A (SP-A) is the vital component of pulmonary surfactant-associated protein (SP), accounting for a half of the total SP. SP-A has the effect to suppress inflammation, regulate immunity, decline pulmonary surface tension and participate SP formation. Clinical studies have found 3 that SP-A concentration is an indicator to evaluate both the severity of pulmonary injury and the therapeutic effect for pulmonary related diseases. On the other hand, SP-A may has the ability to enhance the accuracy of CAP disease evaluation and adopt effective therapeutic measures timely to reduce the mortality of CAP, but such reports are very few. Therefore, this study will make a discussion on the correlation between SPA and prognosis of CAP.

International Conference on Frontiers of Biological Sciences and Engineering (FBSE 2018)
AIP Conf. Proc. 2058, 020033-1–020033-5; https://doi.org/10.1063/1.5085546
Published by AIP Publishing. 978-0-7354-1786-1/$30.00

MATERIALS AND METHODS

General Information

100 CAP patients, from August 2013 to September 2014, were selected randomly. Inclusion criteria 4: simplex CAP patients. Exclusion criteria: patients with combined bronchial asthma, chronic obstructive pulmonary disease, cardiac failure, liver and kidney failure, viral hepatitis, liver cirrhosis, hematological system diseases and malignant tumors.

Grouping Methods

Grouping by CAP Disease Severity

CAP disease severity was evaluated by CURB-65 scoring criteria 5, and patients were divided into 3 groups according to different disease severity: 40 cases in mild group, with 23 males and 17 females, age ranging from 27 to 59 years old (an average age of 39.06 ± 6.31 years); 30 cases in moderate group, with 18 males and 12 females, age ranging from 28 to 60 years old (an average age of 39.11 ± 6.24 years); 30 cases in severe group, with 17 males and 13 females, age ranging from 29 to 60 years old (an average age of 39.09 ± 6.18 years). Comparisons on gender, age and other general information among 3 groups showed no statistically significant difference ($P > 0.05$), with the comparability.

Correlation Grouping of CAP Critical Rating

In accordance with the criteria of CAP critical rating 7, patients were divided into low, intermediate, high and extremely high risk groups. Among those groups, 29 cases in low-risk group, with 18 males and 11 females, age ranging from 27 to 59 years old (an average age of 39.25 ± 7.02 years); 31 cases in intermediate-risk group, with 19 males and 12 females, age ranging from 28 to 58 years old (an average age of 38.97 ± 6.25 years); 27 cases in high-risk group, with 12 males and 15 females, age ranging from 29 to 60 years old (an average age of 39.05 ± 6.17 years); 13 cases in extremely high risk group, with 9 males and 4 females, age ranging from 21 to 60 years old (an average age of 39.05 ± 6.08 years). Comparisons on gender, age and other general information among 4 groups showed no statistically significant difference ($P > 0.05$), with the comparability.

Studying Methods

Fasting venous blood was collected on the 100 CAP cases from 6 a.m. to 8 a.m. on the second day after hospitalization. Serum SP-A and oxygenation index (ELISA method, provided by Medical Center of American Ohio State Hospital). Clinical symptoms and pulmonary function were observed dynamically.

Observing Indicators

Serum SP-A Content

Normal value: 40%-50% 6. The lower the content was, the more serious the disease was.

Correlations between Serum SP-A and CAP Disease Degree

The CAP severity was able to be reflected through hospital stays, mechanical ventilation duration and oxygenation index of patients. Hospital stays, the duration of patients' disease course, can reflect the severity and diagnoses of CAP disease; mechanical ventilation, as one of the main evaluation indicators for patients' pulmonary function, is a vital evaluation criteria for pulmonary function deterioration from quantitative change to qualitative change; Oxygenation index can reflect the changes on pulmonary function through approximate quantitative indicator value. Detection of serum SP-A was administrated and follow-up observation was performed on the immediate treatment for all patients. Hospital stays, mechanical ventilation, oxygenation index and other clinical indexes were recorded; the

relations between serum SP-A and above mentioned clinical indicators were analyzed; whether serum SP-A could reflect the disease severity of CAP patients was discussed.

Statistical Process

SPSS 18.0 statistical software was used to analyze the study data. Mean ± standard deviation (x±s) was shown for measurement data results. One-way analysis of variance (F test) was adopted for measurement data among multiple groups. q Test was applied for the further comparisons among groups. $\alpha = 0.05$ was considered the inspection level.

RESULTS

Correlations between Serum SP-A and CAP Disease Severity

Serum SP-A contents among patients in 3 groups were less than the normal value. SP-A contents among patients between moderate and severe groups were significantly less than that in mild group, showing a statistically significant difference ($P < 0.05$),while the hospital stays and mechanical ventilation duration were distinctly larger than those in mild group, with a statistically significance difference ($P < 0.05$). Oxygenation indexes among patients between moderate and severe groups were remarkably less than that in mild group, showing a statistically significant difference ($P < 0.05$). See table 1.

TABLE 1. Correlation comparisons between serum SP-A and disease degree for patients with community-acquired pneumonia among 3 groups

Group	Cases	SP-A (%)	Hospital stays (d)	Mechanical ventilation duration (d)	Oxygenation index (mmHg)
Mild group	40	39.06 ± 0.31	6.95 ± 0.71	3.08 ± 1.13	352.79 ± 13.08
Moderate group	30	32.10 ± 0.24	11.34 ± 0.85	7.52 ± 1.85	298.64 ± 10.52
Severe group	30	27.36 ± 0.22	15.08 ± 1.30	10.26 ± 2.05	243.13 ± 9.62
F value		6.03	5.67	4.97	6.15
P value		< 0.05	< 0.05	< 0.05	< 0.05

Note: Mild, moderate and severe groups were divided by CURB-65 scoring criteria for CAP disease severity

Correlations Between Serum SP-A and CAP Critical Rating

Serum SP-A contents among patients in 4 groups were less than the normal value. The SP-A contents for patients among intermediate, high and extremely high risk groups were significantly less than that in low-risk group, showing a statistically significant difference ($P < 0.05$), while the hospital stays and mechanical ventilation were remarkably larger than those in low-risk group, with a statistically significant difference ($P < 0.05$). Oxygenation indexes of patients among intermediate, high and extremely high risk groups were significantly less than that in low-risk group, showing a statistically significant difference ($P < 0.05$). See table 2.

TABLE 2. Comparisons between serum SP-A and critical rating for patients with community-acquired pneumonia among 4 groups

Group	Cases	SP-A (%)	Hospital stays (d)	Mechanical ventilation duration (d)	Oxygenation index (mmHg)
Low-risk group	29	39.21 ± 0.42	6.63 ± 0.58	3.04 ± 1.09	352.49 ± 12.28
Intermediate-risk group	31	33.07 ± 0.33	10.75 ± 0.79	6.97 ± 1.79	306.57 ± 11.67
High-risk group	27	28.27 ± 0.28	13.49 ± 1.27	9.22 ± 1.86	248.27 ± 9.79
Extremely high-risk group	13	26.67 ± 0.17	16.34 ± 1.48	11.58 ± 2.14	238.19 ± 8.64
F value		4.36	3.98	5.01	6.03
P value		< 0.05	< 0.05	< 0.05	< 0.05

Note: According to criteria of CAP critical rating, patients were divided into low, intermediate, high and extremely high risk groups.

DISCUSSION

Results in this study indicated that serum SP-A content and oxygenation index among patients with moderate and severe pathogenic condition were significantly reduced, while the hospital stays and mechanical ventilation duration were distinctly prolonged, suggesting that SP-A content had significant correlations to condition and prognosis for patients. Moreover, the lighter of the pathogenic condition on CAP patients was, the higher of SP-A content was, the shorter of the hospital stays was and the better of the prognosis status was. Whereas, the more serious of the pathogenic condition on CAP patients was, the less of the SP-A content was. Meanwhile, the hospital stays and mechanical ventilation duration were distinctly prolonged, indicating a poor prognosis condition for patients. Furthermore, through the establishment of critical rating of CAP pathogenic condition, it was found that SP-A content and oxygenation index of patients among intermediate, high and extremely high risk groups were significantly reduced, while the hospital stays and mechanical ventilation duration were remarkably prolonged, indicating that the higher the SP-A content was, the lighter the risk degree of CAP pathogenic condition was, whereas, the lower the SP-A content was, the serious the risk degree of CAP pathogenic condition was, with significant prolongation in hospital stays and poorer prognosis status. Therefore, SP-A content, to a certain extent, had the ability to reflect the prognosis status among patients.

To sum up, SP-A has a close relationship to CAP prognosis. As a sensitive and accurate specific biological indicator, SP-A is of vital clinical significance on predictions in the pathological injury degree of pulmonary tissues, the prognoses for patients, the risk ratings for CAP and others.

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