

Clinical efficacy of nutrition support therapy combined with antibiotics in the patients of community-acquired pneumonia and its influence on serum pct and crp

Qianqian Zhou, Liqin Zhang, Xiandong Wang,
Quanhong Wang, Dongquan Zhang and Yuan Yuan*
Gansu Provincial Hospital, Intensive Care Unit, Lanzhou, Gansu, PR China

Abstract: To analyze the clinical efficacy of nutrition support therapy combined with antibiotics in the treatment of patients with ICU severe community-acquired pneumonia and its effect on serum procalcitonin (PCT) and C reactive protein (CRP). A total of 90 patients with ICU severe community-acquired pneumonia treated in hospital from September 2016 to June 2017. The patients were randomly divided into A group and B group 45 cases in each group. Both groups were given antibiotic treatment of azithromycin plus cefuroxime sodium in which the A group received enteral nutrition support therapy while the B group parenteral nutritional support therapy. Levels of serum prealbumin (PA), albumin (ALB), transferrin (TF), procalcitonin (PCT) and C reactive protein (CRP) before and after treatment were compared. Before treatment there was found no significant difference in serum PA, ALB and TF levels ($p>0.05$) while after treatment, the serum levels of PA, ALB and TF in the A group were significantly higher than those in the B group ($p<0.05$). The effective rate of the A group was 88.9%, higher than that of the B group ($p<0.05$). In patients with ICU severe community-acquired pneumonia, the treatment of enteral nutrition support therapy combined with antibacterial drugs of azithromycin and cefuroxime sodium can effectively improve the indexes of PA, ALB and TF. The reduce levels of serum PCT and CRP with the good prognosis is important in popularization and application in clinical practices.

Keywords: ICU severe community-acquired pneumonia; enteral nutrition; parenteral nutrition; antibiotics.

INTRODUCTION

Community-acquired pneumonia is an inflammation in the lung parenchyma caused by bacteria, viruses, chlamydia, mycoplasma and other microorganisms outside the hospital and is a common infectious disease (Sakamoto *et al.*, 2017). The patients with severe community acquired pneumonia are critically ill and may suffer from multiple organ dysfunction or even failure in a short period of time. The disease is characterized by rapid progression, high mortality, difficulty for its treatment and poor prognosis (Rahmel *et al.*, 2017). A related study has shown that (Busing *et al.*, 2006) today with increasingly perfect treatment measures of pneumonia and antimicrobial agents, the mortality in patients with severe community acquired pneumonia is still as high as 20% to 30%. The elder patients with the disease are subjected to relatively poor nutritional and immune status due to factors like illness as well as age etc., which is extremely unfavorable for rehabilitation and complications control, so in the process of treatment it requires to not only notice diseases medicine principle and methods, but also pay attention to the intervention on nutrition support (Leroy *et al.*, 1995; Ucar *et al.*, 2015). In recent years, nutrition support therapy combined with antibiotics has attracted more and more attention in the treatment of ICU severe community acquired pneumonia. In clinical practices, the

nutrition support program for these patients mainly includes intestinal therapy and parenteral therapy and many studies have been done in this regard yet with certain controversial results (Yao *et al.*, 2015; Scolapio, 2004). In view of this, this study is aimed to investigate the effect of different nutrition support therapies combined with antibiotics on patients with ICU severe community-acquired pneumonia so as to provide reference for treatment of such patients.

MATERIALS AND METHODS

General information

A total of 90 patients with ICU severe community-acquired pneumonia treated in our hospital (Hospital name) from September 2016 to June 2017. The patients were randomly divided into two groups as group A and group B. Each group has 45 cases including 40 males and 50 females aged 34-68 with average age of (56.7 ± 2.2) years.

Clinical Manifestations: 52 cases of fever, 18 disturbances of consciousness, 20 cough and expectoration.

Underlying disease: There were 45 patients with chronic diseases; some patients had more than 2 diseases at the same time including 4 cases of multiple lacunar infarction, 2 long term bedridden patients with sequelae of cerebrovascular accident and 22 chronic obstructive pulmonary disease.

*Corresponding author: e-mail: barki.gold@gmail.com

The difference in basic data was not statistically significant of comparability between the two groups ($p > 0.05$).

All patients were given antibiotic treatment of azithromycin plus cefuroxime sodium and meanwhile the A group were additionally given nasogastric enteral nutrition support with peptison liquid; while the B group were additionally given parenteral nutrition support mainly by intravenous infusion of compound amino acid (15) and dipeptides (2) injection (500ml: 67g) plus glutamine injection (100ml: 20g) at the infusion rate of 500 ml / 12h. The treatment in both groups lasted 10 d or more.

Observation index

(1) The levels of serum prealbumin (PA), albumin (ALB) and transferrin (TF) were compared before and after treatment. The higher the value of indexes, the better the treatment effect.

(2) The levels of serum procalcitonin (PCT) and C reactive protein (CRP) were compared before and after treatment.

(3) The clinical efficacy was compared between the two groups as follows:

the standard of treatment efficacy is classified as 4 levels in accordance with "Clinical Research Guideline of Antibacterial Agents" issued by Ministry of Health, namely cured, obviously effective, improved and ineffective outcome.

- Cured: The symptoms as well as signs of lung disappeared and peripheral blood returned to normal with no lung inflammation showed by chest X-ray.
- Obviously effective: The symptoms disappeared or got improved, the signs of lung were reduced or disappeared and the peripheral blood was restored to normal with the lung inflammation not completely absorbed seen from the chest
- X-ray. Improved: The symptoms were slightly but not significantly improved with no change in lung inflammation showed by chest X-ray.
- Ineffective: After treatment, there were no obvious changes in symptoms, lung signs as well as chest X-ray results and other antibiotics were required to be used instead. The effective outcome was a sum of cured and effective outcomes.

Statistical processing

All the data were processed by SPSS 21 statistical software in which the measurement data were expressed as "mean \pm standard deviation" ($\bar{x} \pm s$) and the count data "n (%)". The comparison between groups was assessed by χ^2 , $P < 0.05$ suggested there was significant difference of statistical value.

Ethical approval

This study was approved from the institutional ethical review board of Gansu Provincial Hospital, Gansu, China. The reference No. was 1723/GPH-CH/IERB/2016.

RESULTS

Comparison of levels of serum PA, ALB and TF between the two groups.

Before treatment, there was no significant difference in serum PA, ALB and TF levels ($p > 0.05$) while after treatment, the serum levels of PA, ALB and TF in the A group were significantly higher than those in the B group ($p < 0.05$) (table 1).

Before treatment, there was no significant difference between the two groups in serum PCT and CRP levels ($p > 0.05$) while after treatment, the serum PCT and CRP levels in the A group were significantly lower than those in the B group ($p < 0.05$) (table 2).

The effective rate of the A group was 88.9%, obviously higher than that of the B group, that was 77.8% ($p < 0.05$) (table 3).

DISCUSSION

Severe community acquired pneumonia is likely to cause both septic shock and immunosuppression in patients, especially for ICU patients, they suffer from poor physical condition along with long-term bed rest, which increases the difficulty in treatment of ICU patients (Iapichino *et al.*, 2010). For severe pneumonia, there are many treatment methods, which, however, is difficult to be smoothly carried out due to antibiotics abuse and constant changes of pathogens. ICU patients stay in bed for a long time and it is easy for them to have pulmonary infection in the course of lying (Agrati *et al.*, 2010; Lian *et al.*, 2011). Pneumonia is also one of leading causes of death in ICU patients. In addition, patients with severe pneumonia are generally immunocompromised and the elderly are more immunocompromised because of age and other factors with low tolerance. Besides many elderly patients were accompanied with other diseases, which make the treatment more difficult. During hospitalization period, attention should be paid attention not only to the program for treatment and nursing, but also to the intervention on the overall nutrition status so as to avoid adverse effects on immune state and prevent a vicious spiral, so it is very necessary to make researches into nutrition support program in patients of this kind (Agrati *et al.*, 2010; Lian *et al.*, 2011). According to the principle of dietary nutrition, the program is mainly divided into parenteral nutrition support and enteral nutrition support in which the former refers to supplying nutritive substrates by ways of veins, muscles, subcutaneous and abdominal cavity with the vein as the

main one (Braga *et al.*, 2009) while the latter refers to supplying nutritive substrates by oral administration of gastrointestinal tract or tube feed and other forms of nutrition support (Cano *et al.*, 2009).

A study has reported that (McDiarmid, 2002), effective and reasonable nutrition support can increase the patient's nutrition and improve their immunity so that they can get access to comprehensive treatment. Therefore, a comprehensive analysis on the curative effect of nutrition support therapy combined with antibiotics (azithromycin and cefuroxime sodium) given by this study manages to provide reference for the treatment of ICU patients with severe community-acquired pneumonia. The results showed that the effective rate of the A group was 88.9%, which was significantly higher than that of the B group, that was 77.8% ($p < 0.05$) and after treatment, the levels of serum PA, ALB and TF in the A group were significantly higher than those in the B group ($p < 0.05$), suggesting that the enteral nutrition support therapy combined with antibiotics (azithromycin and cefuroxime sodium) gives rise to good prognosis in treatment of patients with ICU severe community-acquired pneumonia and can effectively improve the levels of PA, ALB and TF. This may be because enteral nutrition is more consistent with

the nutrient absorption law of the body than parenteral nutrition.

PCT is a propeptide of calcitonin and not easy to be detected in healthy body with low level. When patients are suffering from infectious diseases, inflammatory mediators and endotoxin can stimulate thyroid to secrete a lot of PCT, whose concentration would be significantly increased after 2h and reached to the top at 12-24h with the increased level proportional to infection severity. It, not affected by hormone and immunosuppressive state in level, has moderately small individual difference and helps to evaluate the condition and prognosis in patients besides frequently serving as a diagnostic marker for bacterial infection (N'Diaye *et al.*, 2017). CRP is one of the acute phase proteins produced by liver, after the infection the liver cells go through rapid secretion in the role of interleukin 6 with the concentration significantly increasing 2h later and reaching the peak at 48h and it is rising before WBC count and increased temperature as a sensitive indicator for reflecting early inflammation, tissue injury and evaluation of treatment response with its level is unaffected by drugs. When the level of CRP is elevated, it is suggested that patients are suffering from infection and need to be treated with anti-infective drugs,

Table 1: Comparison of levels of serum PA, ALB and TF between the two groups ($\bar{x} \pm s$)

Group	n	PA (g/L)		ALB (mg/L)		TF (g/L)	
		before treatment	after treatment	before treatment	after treatment	before treatment	after treatment
A group	45	178.01±39.39	294.62±26.28	28.42±4.39	32.31±2.68	2.08±0.67	2.55±0.39
B group	45	176.12±42.83	256.34±28.07	28.05±5.13	30.52±2.97	2.07±0.75	2.22±0.27
T		0.127	6.093	0.134	7.873	0.156	6.746
P		>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Comparison of levels of serum PCT and CRP between the two groups

Table 2: Comparison of levels of serum PCT and CRP between the two groups ($\bar{x} \pm s$)

Group	N	PCT (ng/mL)		CRP (mg/L)	
		before treatment	after treatment	before treatment	after treatment
A group	45	1.68±0.32	0.54±0.12	123.76±7.84	57.87±3.0
B group	45	1.67±0.29	0.93±0.15	121.05±6.96	71.43±2.6
t		0.133	7.003	0.172	8.054
P		>0.05	<0.05	>0.05	<0.05

Comparison of clinical efficacy between the two groups

Table 3: Comparison of clinical efficacy between the two groups [n (%)]

Group	N	Cured	Obviously effective	Improved	Ineffective	Effective rate (%)
A group	45	7(15.6)	33(73.3)	3 (6.7)	2(4.4)	88.9
B group	45	3(6.7)	3(7.1)	5(11.1)	5(11.1)	77.8
χ^2						9.371
P						<0.05

when the infection is under control, its level will be decreased as well (Zhao *et al.*, 2015). The results of this study showed that after treatment, serum PCT and CRP levels in the A group were significantly lower than those in the B group ($p < 0.05$), indicating that enteral nutrition support therapy combined with antibiotics (azithromycin and cefuroxime sodium ICU) can effectively reduce the level of CRP and PCT in treatment of patients with severe community-acquired pneumonia.

CONCLUSION

In summary, in patients with ICU severe community-acquired pneumonia, the treatment of enteral nutrition support therapy combined with antibacterial drugs of azithromycin and cefuroxime sodium can effectively improve the indexes of PA, ALB and TF and lower the levels of serum PCT and CRP with good prognosis, thus worthy of clinical spreading and application.

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