CHANGES OF THE LEVELS OF PCT AND CRP IN URINARY TRACT INFECTION OF ELDER PATIENTS AND THEIR CLINICAL SIGNIFICANCE

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ABSTRACT

Objective: To analyze the changes of procalcitonin (PCT) and C-reactive protein (CRP) levels in urinary tract infection of elder patients and its clinical significance.

Methods: Randomly, we selected a total of 68 elder patients with urinary tract infection. 32 patients with upper urinary tract infection were enrolled into the Group I, 36 with lower urinary tract infection into the Group II, and 30 healthy subjects who attended the physical examinations into the control group. White blood cell count of blood and urine, PCT and CRP were determined for all patients, and comparison of the levels of PCT and CRP before and after treatment and the correlation analysis between the levels of PCT and CRP were carried out for patients in the observation group.

Results: In two observation groups, white blood cell counts of blood and urine and levels of PCT and CRP were higher than those in the control group, while the levels of PCT and CRP in Group I were higher than those in Group II (p<0.05); after active treatment, significant decreases were identified in levels of PCT and CRP in observation groups (p<0.05); Pearson correlation analysis showed positive correlation between PCT and CRP (r=0.73, p<0.01).

Conclusion: Levels of PCT and CRP are sensitive indicators for diagnosis and auxiliary diagnosis of urinary tract infection of elder patients, and conduces to guiding the clinical medication, which are worthy being promoted in clinical practice.

Keywords: Elder patients, urinary tract, PCT,CRP.

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Introduction

Urinary tract, as a kind of disease frequently seen in elder population, has a very high incidence rate of 0.90%, which is only secondary to the respiratory tract infection[1]. Affected by various factors including the declined nervous reflex, reaction capacity and sensory function of elder population, urinary tract infection shows atypical symptoms, which would interfere with the early diagnosis of disease and delay the treatment opportunity, thereby generating poor outcome[2].

In this study, we observed and evaluated the changes in PCT and CRP levels in urinary tract infection of elder patients, so as to investigate the clinical significance of these two indicators. Detailed information is reported as follows.

Material and methods

General material

We randomly selected 68 elder patients with urinary tract infection who went to this hospital for treatment between January 2017 and December 2017 in accordance with the following criteria:

a) colony count of fresh, clean midstream urine > 105/mL;

b) white blood cell count of sediment of clean midstream urine > 5/HP;

c) patients with urinary irritation but no urinary tract infection;

d) bacterial culture for more than two times showed the same bacteria with colony count not fewer than 105/HP.

Among 68 patients, there were 28 males and 40 females aged between 60 and 78 years old with an average of (65.50±2.00) years old. There were 32 patients with upper urinary tract infection (Group I) and 36 with lower urinary tract infection (Group II). As for complications, 14 patients were diagnosed as lithangiuria, 28 as diabetes mellitus and 22 with prostatic hyperplasia. In addition, 30 healthy subjects who attended physical examination were selected randomly as control group. No statistical significance was identified in difference of age and gender of all patients in three groups.

Exclusive criteria

a) Patients with mental diseases, or declined cognitive function;

b) patients complicated with infectious diseases or trauma;

c) patients who took immunosuppressant or antibiotics within 1 or 2 months;

d) patients with malignancies, hematemesis or autonomous immune diseases;

e) patients who were unable to fulfill this study due to poor compliance.

Research methods

Table for Changes in PCT and CRP Levels of Elder Patients with Urinary Tract Infection was designed, including the gender, age, complications, PCT, CRP, while blood cell count of blood and white blood cell count of urine; meanwhile, these data were recorded for statistical analysis by designated staffs. Detection of these indicators was performed with the blood samples before anti-infection therapy, i.e. 3 mL fasting peripheral venous blood was drawn and placed into the septic tubes, followed by centrifugation at 3000 r/min for 10 min to isolate the serum. Thereafter, Double Antibody Sandwich-Enzyme Linked Immunosorbent Assay (DAS-ELISA) was carried out to determine the level of PCT, latex-enhanced immunoturbidimetry to determine the level of CRP. PCT > 0.5 ng/mL or CRP > 5 mg/L was deemed as positive result.

Statistical methods

Data were analyzed using SPSS 13.0 software. Measurement data that were in normal distribution were presented as mean ± standard deviation ($\bar{x}$±s), while t test was performed for comparisons; Mann-Whitney U test was carried for comparison of data that were not in normal distribution. For comparison of enumeration data, chi-square test was performed. As for correlation analysis, Pearson correlation analysis was adopted. $p<0.05$ suggested that the difference had statistical significance.

Results

General data of all subjects

No statistical significance was identified in comparison of the age and gender among three groups, showing that data were comparable (Table 1).

Group	Age	Gender	Complications		
		(male/female)	Urinary calculi	Diabetes mellitus	Prostatic hyperplasia
Group I	32	60-78 (65.4±1.9)	13/19	6	13
Group II	36	59-77 (65.6±2.2)	15/21	8	15
Control group	30	60-79 (65.6±2.1)	14/16		

Table 1: Comparison of the general data among three groups.

Comparisons of the white blood cell counts of blood and urine and levels of PCT and CRP

In two observation groups, white blood cell counts of blood and urine and levels of PCT and CRP were significantly higher than those in the control group, while levels of PCT and CRP in Group I were significantly elevated in comparison with the Group II (Table 2).

Group	n	White blood cell count of blood (×109/L)	White blood cell count of urine (/μL)	PCT (μg/L)	CRP (mg/L)
Group I	32	9.71±2.00*#	47.40±19.00*#	5.37±2.00*o	68.00±36.00*o
Group II	36	8.23±1.90*	44.90±21.00*	0.93±0.34*	28.30±31.00*
Control group	30	6.00±1.00	3.61±3.00	0.32±0.05	1.71±1.30

Table 2: Comparisons of the white blood cell counts of blood and urine and levels of PCT and CRP.
*Note: *p<0.05 vs. control group; #p>0.05 vs. Group II; op<0.01 vs. Group II*

Comparison of the PCT and CRP levels before and after treatment in observation groups

After treatment, significant decreases were identified in levels of PCT and CRP in comparison with those before treatment (Table 3).

Group	n		PCT (µg/L)	CRP (mg/L)
Group I	32	Before treatment	5.37±2.00	5.37±2.00
		After treatment	0.11±0.05*#	0.11±0.05*#
Group II	36	Before treatment	0.93±0.34	0.93±0.34
		After treatment	0.06±0.01*	0.06±0.01*

Table 3: Comparison of the PCT and CRP levels before and after treatment in observation groups.
*Note: *p<0.05 vs. the levels before treatment; #p>0.05 vs. Group II*

Correlation analysis between the levels of PCT and CRP in observation groups

According to the Pearson correlation analysis, we found that there was positive correlation between levels of PCT and CRP (r=0.73, p=0.009).

Discussion

Studies in recent years have revealed that incidence rate of urinary tract infection has been rising in elder patients due to the particular pathophysiological factors, immobilization or fundamental diseases, which has directly affected the quality of life, or even led to the death in some severe cases. Thus, early diagnosis, dynamic monitoring and active evaluation have critical significance in clinical practice[4].

Based on the clinical research, urinary tract infection, according to its site, is divided into the upper (i.e. acute pyelonephritis) and lower (i.e. acute cystitis) urinary tract infection. Generally, diagnosis, monitoring and evaluation of urinary tract infection are mainly dependent on the routine examinations of urine and blood, which are easily affected by the antibiotics. Besides, culture of pathogenic bacteria of midstream urine is taken as the golden criteria in diagnosis of urinary tract infection, but excessively long culture duration makes effective diagnosis and clinical treatment more difficult, thereby delaying the best opportunity of treatment and affecting the therapeutic efficacy[5-7].

PCT is a kind of protein, and significant increase in its level usually occurs in severe infections of bacteria, fungus or parasite, sepsis and multi-organ failure, instead of the autoimmune, allergy and viral infection, which, thus, reflects the activity of systemic inflammatory responses[8]. CRP, a group of proteins that usually increase acutely in cases of infection and tissue injuries, can activate the complement and enhance the activity of phagocytes, thereby eliminating the pathogenic microorganisms and injured, necrotic or apoptotic cells to protect the human from nature immune processes. Studies on CRP have lasted for decades, and conventional opinion holds that CRP is a non-specific inflammatory indicator[9].

In this study, we monitored the changes in levels of PCT and CRP in urinary tract infection of elder patients and analyzed the clinical significance. From Table 2, significant increases were identified in white blood cell counts of blood and urine and levels of PCT and CRP in urinary tract infection, but the levels in the upper urinary tract infection were much higher than those in the lower urinary tract infection; based on the data in Table 3, after active treatment, levels of PCT and CRP in urinary tract infection were decreased significantly, and there was a positive correlation between the levels of PCT and CRP. Thus, we believed that white blood cell counts of urine and blood can only serve as one of the reference indicators for urinary tract infection due to the lack of specificity, and additionally, it is impossible to locate the infection site precisely, making clinical treatment much difficult.

Changes in level of PCT is closely correlated with the infection and injury of kidney, while infection of upper urinary tract infection usually elevates the level of PCT, significantly higher than that in lower urinary tract infection. Thus, PCT is conducive to early diagnosis and location of urinary tract infection and its site, thus contributing to the treatment of infection; however, studies have indicated a poor sensitivity of PCT[10, 11].

CRP, as an indicator for early diagnosis of infectious disease, will be increased in cases of bacterial or fungal infection or tissue injuries. Thus, infectious, or non-infectious factors can induce an increase of the CRP, which endows CRP a strong sensitivity but a poor specificity. Thus, the combination of PCT and CRP can increase the accuracy of diagnosis and efficacy of clinical treatment for urinary tract infection of elder patients; for elder patients without any clinical manifestations of upper urinary tract infection, increases in PCT and CRP levels may indicate the hidden upper urinary tract infection. Thus, PCT and CRP would be a new orientation for diagnosis and clinical treatment of urinary tract infection in elder patients.

In conclusion, changes in levels of PCT and CRP are sensitive indicators for diagnosis or aux-

iliary diagnosis of urinary tract infection in elder patients, and are conducive to the clinical medication. Thus, they are worthy being promoted in clinical practice.

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