



# Changes of serum CRP, serum uric acid and immunoglobulin in patients with renal damage of systemic lupus erythematosus

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## ABSTRACT

**Objective:** To observe the expression level of serum CRP, serum uric acid and immunoglobulin (IgG, IgA and IgM) in patients with renal damage of systemic lupus erythematosus, and explore their clinical application value. **Methods:** A total of 95 patients with SLE were divided into lupus nephritis group (LN group,  $n = 64$ ) and non-lupus nephritis group (NLN group  $n=31$ ) according to the diagnostic criteria of lupus nephritis, and another 35 healthy subjects were selected as normal control group. Blood samples were collected from all subjects before treatment. Serum CRP and serum uric acid concentrations were measured by ELISA. The levels of serum immunoglobulins were detected by immunoturbidimetry in the same time. Finally, the results were analyzed statistically. **Results:** The levels of serum CRP and serum uric acid in patients with SLE were significantly higher than those in control group. The levels of serum CRP and serum uric acid in LN group of SLE patients were significantly higher than those in NLN group and control group. Serum CRP level in NLN group was significantly higher than that in control group. Serum uric acid level in NLN group was slightly higher than that of the control group, but the difference was not statistically significant. The level of serum immunoglobulin in SLE patients was higher than that in control group. The levels of serum immunoglobulin IgG, IgA and IgM in LN group of SLE patients were significantly higher than those in NLN group and control group. The levels of serum immunoglobulin IgG, IgA and IgM in NLN group of SLE patients were all higher than those in control group. **Conclusion:** Humoral immune of SLE patients with renal injury was activated at different degree, B-cell hyperthyroidism, severe systemic inflammatory response and kidney damage at varying degrees. Serum CRP, serum uric acid and immunoglobulin (IgG, IgA and IgM) may be involved in SLE renal injury pathological process, which is the early diagnosis of reference indicators.

## 1. Introduction

Systemic lupus erythematosus (SLE) was a kind of self-immunity connective tissue disease that affected multiple organs[1]. According to clinical statistical, almost all SLE patients were with renal damage at different degree, even one fifth of severe patients developed to

uremia, endangered people life[2-4]. At present, creatinine, urinary albumin and uric acid were used as renal function index in clinical examination of renal injury, however all of them were not able to diagnose the early condition of renal damage in SLE patients, delayed early treatment[5,6]. This research detected serum CRP level, serum uric acid concentrations and immunoglobulin in SLE patients with renal damage, explored their clinical significance in estimating pathogenesis, early diagnosis and illness condition of SLE patients with renal damage.

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## 2. Material and method

### 2.1 General data

A total of 95 cases of SLE patients who were admitted in our hospital from January 2013 to September 2016 were selected and divided into lupus nephritis group (LN group) and non-lupus nephritis group (NLN group) according to the diagnostic criteria of lupus nephritis. 64 cases were in LN group, 6 males, 58 females, aged from 15-66 years old, NLN group was consisted of 31 cases, 3 males, 28 females, aged from 14-65 years old. In addition, selected 35 cases of healthy people as control group, including 4 males, 31 females, aged from 16-67 years old. All of patients were diagnosed according to 'Diagnosis and treatment guidance of Systemic lupus erythematosus' standard that published in 2010[9]. Gender and age of all subjects were no significant difference and could be carried out control experiment. The patients and their family were informed and signed informed consent by patients themselves, this research was approved by hospital ethics committee.

### 2.2 Incorporation and exclusion criteria

Diagnostic criteria of systemic lupus erythematosus[9,10]: (1) patients with butterfly erythema at face, accompanying with arthralgia, cardiovascular system damage and renal damage; (2) blood routine examination with obvious blood platelet decreased, hemameba reduced and anemia.

Diagnostic criteria of lupus nephritis[7,8]: (1) hemameba or red blood cell was more than 5 in high power field of every urinal microscopic examination; (2) 24 h urine protein was not less than 0.5 g in patients; (3) patients were demonstrated by renal pathological examination.

Exclusion criteria: (1) patients who took drug that affected uric acid level; (2) patients with primary hypertension, cardiovascular disease, diabetes or drug-induced renal damage; (3) patients with self-immunity disease history.

### 2.3 Measurement indexes

Extracted 2-3 mL of fasting periphery venous blood of all subjects before treatment, centrifuged at low temperature and stocked at -20 °C for detection. Measurement indexes: C reactive proteins (CRP) and serum uric acid. Detection method: ELISA method; detection equipment: enzyme-link meter (American Beckman Company). Immunoglobulin indexes: IgG, IgA and IgM; Detection method: immunity transmission turbidity; detection equipment: AU680 fully automatic biochemical analyzer (American Beckman Company). All of measurement kits were purchased from Shanghai Meilian Biotechnology Co. Ltd. Operation was strict with introduction.

### 2.4 Statistical method

Statistical Software SPSS 20.0 was used for all data processing and analyzing, all of measurement data was represented by mean  $\pm$  standard deviation (Mean  $\pm$  SD), t-test was used,  $P < 0.05$  indicated the difference was statistical significant.

## 3. Results

### 3.1. Change of serum CRP and serum uric acid level in all groups

The levels of serum CRP and serum uric acid in patients with SLE were significantly higher than those in control group, there was obvious difference ( $P < 0.05$ ). The level of serum CRP and serum uric acid in LN group of SLE patients were respectively (21.17 $\pm$ 17.23) mg/L and (392.59 $\pm$ 251.64)  $\mu$ mol/L, which was higher than NLN group and control group, there was significant difference ( $P < 0.05$ ); Serum CRP level of SLE patients in NLN group was (13.54 $\pm$ 15.67) mg/L, higher than control group, there was obvious difference ( $P < 0.05$ ). Serum uric acid level of SLE patients in NLN group was (244.17 $\pm$ 203.56)  $\mu$ mol/L, slightly higher than control group, there was no significant difference ( $P < 0.05$ ). As shown in Table 1.

**Table 1.**

Comparison of serum CRP and serum uric acid level in all groups.

Group	n	CRP (mg/L)	Serum uric acid ( $\mu$ mol/L)
Control group	35	6.42 $\pm$ 5.36	215.43 $\pm$ 142.37
SLE group	95	17.92 $\pm$ 16.60 <sup>#</sup>	321.65 $\pm$ 220.92
NLN group	31	13.54 $\pm$ 15.67 <sup>#</sup>	244.17 $\pm$ 203.56
LN group	64	21.17 $\pm$ 17.23 <sup>#*</sup>	392.59 $\pm$ 251.64 <sup>#*</sup>

Note: Compared with control group, <sup>#</sup> $P < 0.05$ ; Compared with NLN group, <sup>\*</sup> $P < 0.05$ .

### 3.2. Change of serum immunoglobulin level in all groups

The levels of serum immunoglobulin in patients with SLE were significantly higher than those in control group, there was significant difference ( $P < 0.05$ ). The level of serum immunoglobulin IgG, IgA and IgM in LN group of SLE patients were respectively (23.73 $\pm$ 7.18) g/L, (5.38 $\pm$ 2.17) g/L and (3.16 $\pm$ 1.67) g/L, which was higher than NLN group and control group, there was significant difference ( $P < 0.05$ ); The level of serum immunoglobulin IgG, IgA and IgM of SLE patients in NLN group were respectively (18.56 $\pm$ 3.65) g/L, (3.79 $\pm$ 1.64) g/L and (1.94 $\pm$ 1.21) g/L, which was higher than control group, comparison was significant statistical ( $P < 0.05$ ). As shown in Table 2.

**Table 2.**

Comparison of serum immunoglobulin level in all groups.

Group	n	IgG (g/L)	IgA (g/L)	IgM (g/L)
Control group	35	11.32 $\pm$ 2.48	1.05 $\pm$ 0.63	1.17 $\pm$ 0.63
SLE group	95	21.78 $\pm$ 3.45 <sup>#</sup>	4.31 $\pm$ 1.83 <sup>#</sup>	2.43 $\pm$ 1.41 <sup>#</sup>
NLN group	31	18.56 $\pm$ 3.65 <sup>#</sup>	3.79 $\pm$ 1.64 <sup>#</sup>	1.94 $\pm$ 1.21 <sup>#</sup>
LN group	64	23.73 $\pm$ 7.18 <sup>#*</sup>	5.38 $\pm$ 2.17 <sup>#*</sup>	3.16 $\pm$ 1.67 <sup>#*</sup>

Note: Compared with control group, <sup>#</sup> $P < 0.05$ ; Compared with NLN group, <sup>\*</sup> $P < 0.05$ .

#### 4. Discussion

Systemic lupus erythematosus (SLE) was a kind of chronic autoimmune disease that affected multiple organs or multiple systems, kidney was main target organ and common complication was lupus nephritis (LN)[11–13]. Precise diagnosis of early SLE renal damage was key to treat reasonably renal damage in SLE patients and reduce mortality rate. This research was aimed to detect serum CRP, serum uric acid level and immune function in patients with renal damage of systemic lupus erythematosus, and analyze their clinical application value.

Lupus nephritis was caused by SLE renal damage; its main pathogenesis was inflammatory reaction that resulted from activated immune system. CRP was an acute protein that secreted by liver cell when body was in inflammatory reaction, its serum concentration reflected inflammatory degree, which was widely used as index that judged infective disease and illness condition in clinic[14,15]. In this research, compared with control group, serum CRP of SLE patients in NLN group and LN group was increased obviously, the difference in all groups could reflect renal damage degree in SLE patients at some extent. In addition, clinical research have demonstrated that[15] almost all SLE patients were with varying degree of renal damage, SLE related renal dysfunction or failure was main cause of death. It was reported that serum uric acid increasing could result in renal damage through multiple approaches[16]. Uric acid was end-product of purine metabolism, elimination from intestinal tract and kidney, if renal function that cleared uric acid was abnormal, would affect serum uric acid level. Serum uric acid level was closely related to body renal damage, it was demonstrated that serum uric acid in patients with diabetic nephropathy, patients with hypertensive nephropathy and SLE patients was all increased[17]. In this research, The levels serum uric acid of SLE patients in LN group were significantly higher than those in NLN group and control group, serum uric acid level of SLE patients in NLN group was slightly higher than control group, there was no significant difference. This revealed that serum uric acid level in SLE patients with renal damage was increased more obviously.

Serum uric acid and CRP level increased might be related to SLE patient renal damage level. The reason was that renal damage in SLE patients would not clear serum uric acid that caused serum uric acid concentration enhanced. On the one hand, high concentration uric acid induced renin high expression and nitric oxide synthase low expression, injury vascular endothelial function, caused glomerulus large, the severe patients might appear glomerular sclerosis[18]. On the other hand, When serum uric acid concentration was increased continuously in patients body and reached threshold value, there

would form crystalline sodium urate. Immune cell such as dendritic cell, neutrophil granulocyte and macrophage Toll-like receptor was able to recognize crystalline sodium urate and activate NLRP3 inflammasome and induce inflammatory reaction[19,20], thereby caused serum CRP concentration increased. Besides serum uric acid increased also could activate NF- $\kappa$ B and COX-2 expression, induce vascular smooth muscle cell chemokine protein generated, resulted in renal vascular inflammation and serum CRP increase [21]. Therefore, serum uric acid and CRP concentration increased might be related closely to renal damage in SLE patients, combined detection of serum uric acid and serum CRP concentration could be used as examination index of renal damage.

Except for renal damage, SLE patients also were with immune system dysfunction. Immunoglobulin, a kind of immune effector molecule with antibody activity, was important index that reflected humoral immune function. IgG accounted for 70%-75% of serum immunoglobulin, only existed as monomers which was most important and most everlasting antibody in primary immune response[22]. IgA content in serum was second to IgG, it could phagocytosis target cell combined with antibody. Sterilization, bacteriolysis and promote phagocytosis of IgM was over 500 times than IgG, it played critical role in early defence and mainly distributed in serum. In This research, immunoglobulin IgG, IgA and IgM level of SLE patients in LN group were higher than that in NLN group and control group; immunoglobulin IgG, IgA and IgM level in NLN group were higher than control group, the difference was significant statistical. It was revealed that compared with control group, serum immunoglobulin level of SLE patients increased, humoral immune function was activated at different degree, moreover the activation in patients with LSE was more obvious. The reason might be B cell hyperfunction, secreted immunoglobulin massively, which caused humoral immune function unbalanced, promoted the renal damage development of SLE patients[23]. The abnormal concentration of immunoglobulin IgG, IgA and IgM suggested that humoral immune function was abnormal in SLE patients and was closely related to renal damage.

In conclusion, this research found that serum CRP and serum uric acid in control group, SLE patients LN group and SLE patients NLN group were successively increased and inflammatory reaction and renal damage degree were successively enhanced; serum immunoglobulin level were gradually increased, humoral immune function was activated at varying degree. Serum CRP, serum uric acid and immunoglobulin level change might involve and regulate pathological function of SLE patients, which had clinical significance in judging general inflammatory reaction and renal damage degree and clinical diagnosis of illness condition.

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