

The Effect of Hyperuricemia on the Rate of Contrast-Induced Nephropathy in Patients with Coronary Angiography

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Abstract

Introduction: There is little information about the relationship between hyperuricemia and contrast induced nephropathy. The present study aimed to evaluate the relationship between hyperuricemia and contrast induced nephropathy among patients, who had undergone coronary angiography.

Methods: In the current study, 200 consecutive patients with coronary artery disease, who underwent coronary angiography in Modarres hospital, were enrolled. According to the available data, the upper limit normal level of uric acid was defined as 7 mg/dl in males and 6.5 mg/dl in females. By increasing level of serum creatinine to 0.5 mg/dl (or 25% enhancement) from basic level of creatinine during 48 hours of introduction of contrast agent, diagnosis of Contrast Induced Nephropathy (CIN) was established. The relationship between hyperuricemia and CIN was then assessed.

Results: There is a significant difference between normouricemic patients and hyperuricemic patients, in aspect of weight ($P = 0.011$) and uric acid ($P = 0.001$); however, other quantitative and qualitative variables including age, volume of contract agent, creatinine level after angiography, hemoglobin level, gender, arterial access type, number of involved vessels, were insignificant between the two groups ($P > 0.05$). Moreover, as an essential finding, CIN was shown in 9% of normouricemic patients and 10% of hyperuricemic patients with no significant difference between the two groups ($P = 0.6$).

Conclusions: Our study suggests that hyperuricemia may not significantly increase the rate of the contrast-induced nephropathy in patients, who had undergone angiography.

INTRODUCTION

Contrast-Induced Nephropathy (CIN) is defined as acute reduction kidney function, according to 25% or 0.5mg/dl increase in serum creatinine during 48 hours since introduction of contract agent [1, 2]. It is the third cause of acute renal failure and such patients have high rates of vascular complications and longer hospitalization time [3-6]. Renal failure following CIN may lead to hemodialysis for the involved patients that leads to escalating hospital mortality up to 40% and mortality during the next two years up to 80%. Hyperuricemia, as a risk factor, plays an important role in various types of diseases. Nevertheless, there is little information about the relationship between hyperuricemia and CIN; for instance, by tubular obstruction, uric acid plays its role in pathogenesis of CIN. Moreover, through increasing oxygen radicals, activation of Renin-Angiotensin System (RAS), rising level of Endothelin 1 and

inhibition of nitric oxide, hyperuricemia is involved in pathogenesis of CIN [7-12]. According to increasing rate of coronary angiography and angioplasty, and considering the fact that CIN is a relatively common and preventable condition, the present study evaluated the relationship between hyperuricemia and contrast induced nephropathy among patients, who had undergone coronary angiography.

METHODS

In the current study, 100 consecutive patients with hyperuricemia and 100 consecutive normouricemic patients with coronary artery disease, who had undergone coronary angiography at Modarres hospital, during 2013 to 2014, were enrolled. According to the available data, the upper limit normal level of uric acid was defined as 7 mg/dl in males and 6.5 mg/dl in females. The exclusion criteria of this study were being

pregnant, receiving contract agent during the last week and having Glomerular Filtration Rate level (GFR) less than 30. Increasing level of serum creatinine to 0.5 mg/dl (or 25% enhancement) from basic level of creatinine during 48 hours of introduction of contrast agent was defined as CIN. The relationship between hyperuricemia and CIN was assessed. Descriptive and analytic studies were performed using the SPSS (version 21) software; in order to describe the data, average and frequency percentages were used, and Chi square and Independent T-test were used for analysis of qualitative and quantitative data, respectively. P-values of less than 0.05 were considered statically significant. A written informed consent was obtained from all participants and the institutional review board approved the study.

RESULTS

The total number of 200 patients enrolled in our study was divided to two groups including: 100 normouricemic patients and 100 hyperuricemic patients. In order to compare quantitative variables of this study, both groups of patients were analyzed by independent T-test. Based on this test, there was a significant difference between normouricemic patients and hyperuricemic patients, in aspects of weight ($P = 0.011$) and uric acid ($P = 0.001$); however, other quantitative variables including age, volume of contract agent, creatinine level before and after angiography and hemoglobin level had no significant differences ($P > 0.05$). In order to compare the qualitative variables of both groups of patients (normouricemic patients and hyperuricemic patients), Chi Square test was performed. On this basis, the relationship of qualitative

variables including gender, arterial access type, number of involved vessels, and left ventricular ejection fraction was insignificant between the two groups ($P > 0.05$).

Moreover, as an important finding, contrast-induced nephropathy was shown in 9% of normouricemic patients and 10% of hyperuricemic patients that showed no significant difference between the two groups ($P = 0.6$).

DISCUSSION

In our study, which was performed to determine the relationship between hyperuricemia and CIN, according to the aforementioned definition, in normouricemic patients 9% and in hyperuricemic patients 10% had CIN. The research of Omer Toprak et al. on 266 patients, who underwent angiography for determining the frequency of CIN among 126 hyperuricemic patients and 120 normouricemic patients, showed that the incidence of CIN in normouricemic and hyperuricemic patients was 2.9% and 15.1%, respectively [13, 14]. In fact, comparing results of the study of Omer Toprak et al. with the present study revealed that amongst both groups of normouricemic and hyperuricemic patients, other factors had interference in occurrence of CIN. Comparing results of the present research with the research of Yong Liu et al. on patients that had undergone angiography for determining the frequency of CIN among 211 hyperuricemic patients and 577 normouricemic patients showed that the incidence of CIN in normouricemic and hyperuricemic patients was 1.4 and 8.1%, respectively. Results of the study by Yong Liu et al. demonstrated that among both groups of normouricemic and hyperuricemic patients, other factors including age older

Table 1: Comparison between of Normouricemia and Hyperuricemia Group

	Normouricemia Group (N = 100)	Hyperuricemia Group (N = 100)	P value
Age	58.93 + 10.76	61.23 + 10.43	NS
Sex (male)	69 (69%)	60	NS
weight (kg)	73.700 ± 12.23	78.380 ± 13.47	0.011
Hypertension	56	63	NS
Diabetes mellitus	30	28	NS
Hyperlipidemia	42	41	NS
Smoker	33	37	NS
creatinine level before angiography (mg/dl)	1.15 ± 0.23	1.15 ± 0.22	NS
creatinine level after angiography (mg/dl)	1.20 ± 0.43	1.41 ± 0.59	NS
Hemoglobin level (mg/dl)	13.42 ± 1.76	13.67 ± 1.81	NS
Uric acid (mg/dl)	4.90 ± 1.24	7.84 ± 1.35	0.001
Radial arterial access	15	15	NS
number of involved vessel			NS
1VD	68	78	
2VD	27	16	
3VD	4	6	
EF			NS
EF>50	30	35	
30>EF>50	60	50	
30<EF	10	15	
Volume of contract agent	338.30 ± 142.25	306.20 ± 139.65	NS
Contrast induced nephropathy	9%	10%	NS

EF: Left ventricular ejection fraction,

Data are presented as mean ± SD, No (%) and No.

On the other hand, according to the study of Maryam Pakfetrat et al., CIN occurred in 15.5% of patients and revealed that level of serum creatinine before angiography, volume of contrast agent, diabetes mellitus and dehydration had a significant relationship with occurrence of CIN; nevertheless, age, gender and level of uric acid had no significant difference among the two groups including CIN group and non CIN group [16]. The results of these studies and our study suggested that there are some controversies about factors that increase the level of serum creatinine after angiography, which may be due to different conditions and interfering factors of various studies.

Our study suggests that hyperuricemia may not significantly increase the rate of the contrast-induced nephropathy in patients, who had undergone angiography. Studies with large sample sizes and detailed categorization were recommended for future investigations.

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