



Effect of allopurinol in the prevention of contrast-induced nephropathy in patients undergoing angioplasty: randomized clinical trial

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Article info

Article History:

Received: 16 Oct. 2019

Accepted: 02 Nov. 2019

ePublished: 20 Dec. 2019

Keywords:

Percutaneous Coronary Intervention, Allopurinol, Angioplasty

Abstract

Introduction: Allopurinol could decrease the undesirable effects of free radicals and then prevent contrast induced nephropathy (CIN). Therefore, it may be useful for reducing the ischemia-reperfusion induced nephropathy and inhibiting nitric oxide synthesis produced in CIN. This study was performed aiming to determine the effect of allopurinol in the prevention of CIN in patients undergoing angioplasty.

Methods: In this randomized clinical trial, 100 patients (50 cases as the intervention group receiving allopurinol 300 mg one day and one hour before angiography and 50 cases as the control group) were evaluated. CIN was considered if the serum creatinine (SCr) value was increased 25% in relation to its basic value. Additionally, the prevalence of CIN was evaluated.

Results: The case and control groups had CIN 38% and 12%, respectively ($P = 0.003$). Hyperuricemia was significant indicator of higher CIN rate in the control group (37.5% versus 7.1%) ($P = 0.044$).

Conclusion: Finally, the administration of allopurinol before procedure might prevent CIN following elective percutaneous coronary intervention (PCI) and decrease the rate of CIN.

Citation: Bodagh H, Esfahani Z, Aslanabadi N, Amiri B, Heidari-Sarvestani A. **Effect of allopurinol in the prevention of contrast-induced nephropathy in patients undergoing angioplasty: randomized clinical trial.** J Anal Res Clin Med 2019; 7(4): 118-21. Doi: 10.15171/jarcm.2019.022

Introduction

The coronary artery disease (CAD) is the main cause of death in most countries, especially in 20.0%, 7.0%, and 1.3% of the elderly, individuals aged 45-64 years, and individuals aged 18-45 years with prevalence rate in men and women as 22.3% and 37.5%, respectively. Additionally, it could result in high morbidity rate and related costs. The severity of CAD involves silent ischemia, stable and unstable angina, acute myocardial infarction (MI), ischemic cardiomyopathy, sudden cardiac death, arrhythmia, and cardiogenic shock.¹⁻³ There are multiple risk factors for CAD such as hypertension, hyperlipidemia, family history, and smoking.⁴ The early diagnosis and treatment is important for decreasing the burden of disease.⁵

Percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) are two main therapeutic methods.^{6,7} Although PCI is a beneficial alternative for CABG, the usage of contrast media and method of procedures may result in frequent MI, thrombosis, and bleeding. The allergic hypersensitivity to contrast media and contrast-induced nephropathy (CIN) might be observed as the third cause of acute renal failure.⁸⁻¹⁰ These problems could lead to longer hospital stay. Currently, female gender and hyperuricemia have been mentioned as risk factors for CIN and administration of uric acid is proposed for the prevention of CIN.¹¹ This study was aimed to determine the undesirable effect of allopurinol in the prevention of CIN in patients undergoing angioplasty.

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Methods

The present study (IRCT no: 20190406043182N1) was conducted on 100 consecutive patients with CAD undergoing elective PCI in Madani educational hospital in 2017 after obtaining an informed consent form from the patients and approval by the ethics committee (IR.TBZMED.REC.1397.959). The patients aged > 55 years as well as with the first experience of angioplasty, elective procedures, and serum creatinine (SCr) value > 1.1 mg/kg were included in the study. The exclusion criteria were a history of acute/chronic renal failure, diabetes mellitus (DM), emergency angioplasty, and a family history of renal diseases. The baseline blood sample was taken from all patients during the pre-procedure period and SCr, uric acid, calcium, magnesium, and albumin were measured. In the intervention group, allopurinol (100 mg tablets, Jalinous Co., Iran) was administered 300 mg one day and one hour before angiography. The control group received placebo. All procedures were performed by an experienced cardiologist. Not only the SCr value was post-procedurely measured 72 hours later, but also the urine sample was assessed in regard to proteinuria. The CIN was considered if the second value was increased as 25% in relation to the basic value. All laboratory tests were conducted in a given center. The prevalence rate of CIN was compared between the two groups.

The data were analyzed using the t-test and chi-square tests in the SPSS software (version 20, IBM Corporation, Armonk, NY, USA). The significant P-value was considered to be 0.05.

Results

The demographic characteristics were shown

in table 1.

The CIN frequency was higher in the case group [6 (12%) and 19 (38%) in the case and control groups, respectively] ($P = 0.003$), however some factors [e.g. age, gender, congestive heart failure (CHF), and number of involved vessels] were not related to CIN in any group ($P > 0.050$).

Discussion

This study was conducted to determine the prevalence rate of CIN following elective PCI with and without allopurinol usage. A CIN rate of 38% versus 12% were found in the case and control groups, respectively; this was only explained by the presence of hyperuricemia. The study by Iranirad et al.¹³ revealed that CIN was present in 11.4 % and 15.7 % in the allopurinol and control groups, respectively and then, they concluded that allopurinol could have no considerable effect on the efficient hydration due to the prevention of CIN in the high-risk patients. Sadineni et al.¹⁴ compared three groups who were receiving N-Acetyl-Cysteine (NAC), allopurinol, and placebo and they reported 20, 16, and 36% rates for CIN in respectively NAC, allopurinol, and placebo groups, demonstrating a significant difference between the allopurinol and placebo groups. Moreover, they similarly reported remarkable consequences of hyperuricemia in the development of CIN. The effective role of allopurinol in the prevention of CIN which was confirmed by Unal et al.¹⁵ and Kumar et al.,¹⁶ demonstrated that the prophylactic administration of allopurinol was better than NAC in regard to the prevention of CIN in patients undergoing coronary angioplasty; this findings is the same as that of the current study.

Table 1. Characteristic data of the two groups

Variables	Age (mean \pm SD)	Gender (male) (%)	History of heart failure (%)	Hyperuricemia (%)	Multi-vessel involvement (%)
Case group	63.5 \pm 7.4	66.0	16.0	16.0	54.0
Control group	63.8 \pm 7.7	62.0	18.0	22.0	52.0
P	0.843	0.678	0.790	0.444	0.841

SD: Standard deviation

Erol et al.¹⁷ reported that CIN was occurred in 7.5 % of the control group and nobody in the allopurinol group showed significant difference as found in the present study. Ghelich et al.¹⁸ suggested that administration of allopurinol in patients undergoing angioplasty could not be efficient in the prevention of CIN; this finding was not in line with that of the current study.

Conclusion

Totally, the CIN following elective PCI can be prevented by the use of allopurinol before procedure. However, further studies with a larger sample size and multi-center sampling would offer more definite results.

Acknowledgments

This study was financially supported by Tabriz University of Medical Sciences, Tabriz, Iran.

Authors' Contribution

Haleh Bodagh: Approval of final version of

manuscript to be published;

Zahra Esfahani: Preparation of article draft or revising it, study design;

Naser Aslanabadi: Considerable contribution to data gathering and analysis and interpretation of data;

Bitam Amiri: Preparation of article draft or revising it, study design;

Ali Heidari-Sarvestani: Preparation of article draft or revising it, study design.

Funding

The study was financially supported by grants from the medical research center of Tabriz University of Medical Sciences.

Conflict of Interest

Authors have no conflict of interest.

Ethical Approval

This study was confirmed by the ethics committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.959).

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