

Association Between Hyperuricemia with Increased Intima-Media Thickness Hyperuricemia and Atherosclerosis

Alberto Francisco Rubio-Guerra*, Carolina Guerrero-Garcia and Alberto Maceda-Serrano

Metabolic and Research Clinic, Hospital General de Ticomán, México City, Mexico

***Corresponding Author:** Alberto Francisco Rubio Guerra, Metabolic and Research Clinic, Hospital General de Ticomán, México City, Mexico.

Received: August 25, 2025; **Published:** September 26, 2025

Abstract

Introduction: Hyperuricemia has been associated with endothelial dysfunction. The increase of carotid intima-media thickness, has been directly associated with atherosclerosis, myocardial infarction and stroke, and may be used as a screening test for the evaluation of the risk of coronary artery disease.

Objective of the Study: The objective of this work is to evaluate the association between hyperuricemia and intima media thickness.

Methods: We included 80 adult patients with uric acid > 5.5 mg/dl, referred from primary care clinics, in which Fasting serum uric acid (enzymatic method) was measured. Also, B-mode color imaging of extracranial carotid arteries was obtained using high-resolution ultrasound (ESAUTE MEGAGP, Italia) equipped with a 10 MHz linear transducer.

The association between uric acid levels and intima media thickness was performed with odds ratio and the Pearson correlation coefficient.

Results: We found a significant correlation between hyperuricemia and intima media thickness ($R = 0.666$, $p = 0.00001$)

The Odds ratio for the presence of increased intima media thickness in patients with uric acid levels greater than 7 mg/dl was 4.56 (CI 1.58-13.14, $p = 0.0049$).

Conclusion: We found that uric acid values, in patients with hyperuricemia, increase the risk for increased intima-media thickness, a surrogate marker of atherosclerosis.

Our results suggest that serum levels of uric acid greater than 7 mg/dl may be involved in the development of atherosclerosis.

Keywords: Uric Acid; Atherosclerosis; Intima-Media Thickness; Hyperuricemia

Introduction

Uric acid is the end-product of purine metabolism in humans, in normal conditions has a protective effect against oxidative stress on organic molecules, plays an important role in immunity, and promotes hominid intellectual function too [1].

A chronic increase in uricemia has been associated with activation of the renin-angiotensin system, also reduces nitric oxide levels in endothelial cells; both pathways lead to endothelial dysfunction, inflammation, atherosclerosis, insulin resistance and metabolic syndrome [2].

Citation: Alberto Francisco Rubio-Guerra, *et al.* "Association Between Hyperuricemia with Increased Intima-Media Thickness Hyperuricemia and Atherosclerosis". *EC Pharmacology and Toxicology* 13.10 (2025): 01-05.

Although many experimental and epidemiological data have suggested a possible role for hyperuricemia in inducing endothelial dysfunction, and that patients with gout have an increased risk of cardiovascular disease, not all studies have shown a causal role for uric acid in the development of coronary heart disease or death from cardiovascular causes, perhaps because the wide range of uric acid values in those studies. Several guidelines have characterized hyperuricemia as serum uric acid levels greater than 7.0 mg/dl for men, and 6 mg/dl for women [3,4].

The increase in the thickness of the carotid intima-media measured by high resolution ultrasonography, has been directly associated with atherosclerosis, myocardial infarction and stroke, and may be used as a screening test for the evaluation of the risk of coronary artery disease [5].

Aim of the Study

The aim of this work is to evaluate the association between hyperuricemia and intima media thickness.

Methods

We included 80 adult patients with uric acid > 5.5 mg/dl, referred from primary care clinics.

B-mode color imaging of extracranial carotid arteries was obtained using high-resolution ultrasound (ESAUTE MEGAGP, Italia) equipped with a 10 MHz linear transducer. Subjects were evaluated lying in the supine position with hyperextension of the neck. Measurements of the distal wall of both; the common and internal carotid arteries were obtained. Registers were performed at the end of the diastole, and all determinations were performed by the same certified ultrasonographer that was blinded to the study.

Fasting serum uric acid (enzymatic method) was measured in all patients. Serum glucose (glucose oxidase), creatinine (JAFPE), lipid profile (CHODPAP) and triglycerides (triglyceride-pap) were also performed in all subjects. All venous samples were collected in the morning after a 12h overnight fast. The determinations were performed by personnel blinded to the study.

Patients with any of the following diagnoses were excluded from the study: decompensate diabetes mellitus (fasting blood glucose > 250 mg/dl); hepatic, or renal failure; evidence of valvular heart disease; secondary hypertension; hyperkalemia, history of angioedema, autoimmune disease, cancer or chemotherapy, hypersensitivity and pregnancy; or a history of alcohol or psychotropic drug abuse.

Data is presented as the mean $\pm$ standard deviation. The association between uric acid levels and intima media thickness was performed with odds ratio and the Pearson correlation coefficient.

The study was conducted with the approval of the Research and Medical Ethics Committee of our hospital, in accordance with the Helsinki declaration. Participants provided informed, written consent before their inclusion in the study protocol.

Results

Basal characteristics of patients are shown on table 1. Briefly, mean age was 43.7 ± 3.41 years, and our patients were predominantly with obesity or overweight.

The men level of serum uric acid was 6.72 mg/dl.

Age (years)	43.7 ± 3.41
Gender M/F	36/44
Blood Pressure (mm Hg)	128 ± 15/84 ± 8
Waist Circumference (cm)	97.5 ± 6.03
Body Mass Index	29.7 ± 2.1
Intima-Media Thickness (mm)	0.095 ± 0.01
Fasting glucose (mg/dl)	96.4 ± 3.6
Uric Acid (mg/dl)	6.72 ± 1.2
Total Cholesterol (mg/dl)	187.38 ± 34.88
High Density lipoproteins (mg/dl)	34.68 ± 8.7
Triglycerides (mg/dl)	194.8 ± 84.2

Table 1: Basal characteristics of patients.

We found a significant correlation between hyperuricemia and intima media thickness ($R = 0.666$, $p = 0.00001$) (Figure 1).

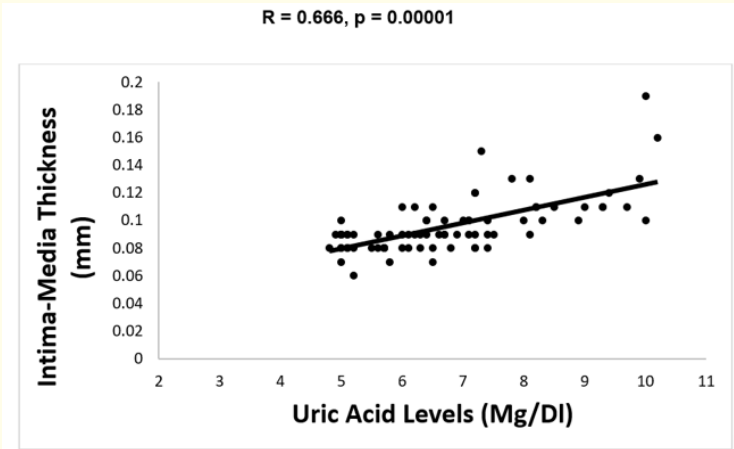


Figure 1: Correlation between uric acid levels and intima-media thickness.

The odds ratio for the presence of increased intima media thickness in patients with uric acid levels greater than 7 mg/dl was 4.56 (CI 1.58-13.14, $p = 0.0049$).

Discussion

In this paper we found that uric acid values, in patients with hyperuricemia, raise the risk for increased intima-media thickness, a surrogate marker of atherosclerosis. It is important to underline the fact that the intima-media thickness was measured by the same ultrasonographer, who was unaware of the study, this fact produced reliable and accurate information that enabled an unbiased analysis of the results.

Several studies have shown an association between hyperuricemia and coronary heart disease, peripheral artery disease and stroke [6], also, uric acid has been linked to a larger infarct size, and to more severe coronary artery involvement [7]. Recent studies show a strong correlation between hyperuricemia and ischemic heart disease, although the cutoff point from which uric acid increases cardiovascular risk has not been established adequately [1,3].

However, in other studies the results are contradictory, as the report from Khameneh Bagheri, *et al.* that included 100 patients with acute coronary syndromes, in whom the HEART score was calculated, the correlation between the measured uric acid levels and the calculated HEART score, did not reach statistical significance, it is important to say that in this study patients were older and had lower serum uric acid levels that in our report [8].

Malloberti, *et al.*'s did not find association between uric acid levels and coronary artery disease and left ventricular diastolic dysfunction in 231 subjects with chronic coronary syndromes, also, their patients were older and had lower serum uric acid levels that ours [9]

Some authors have proposed that uric acid has a main role in the early phase of the development on atherosclerosis, but not in more advanced stages [10].

We found a significant association between serum uric acid values and intima-media thickness, the main difference between this study and other reports, is that our patients had higher urate levels than those found in other reports, besides, our patients were younger, and perhaps, with atheroma plaques in early phases that those included in studies with chronic disease, this fact requires further research.

Several observational studies suggest a reduction in cardiovascular events in patients with various cardiovascular risk factors treated with xanthine oxidase inhibitors [11]. However, most studies in this area have included a low number of patients [10] and the evidence from randomized controlled trials is scarce and contradictory [11]. If the treatment of hyperuricemia can reduce cardiovascular events, it requires more evidence.

Conclusion

We found that uric acid values, in patients with hyperuricemia, increase the risk for increased intima-media thickness, a surrogate marker of atherosclerosis.

Our results suggest that serum levels of uric acid greater than 7 mg/dl may be involucrate in the development of atherosclerosis.

More controlled studies are required to establish whether the management of asymptomatic hyperuricemia reduces the incidence of cardiovascular events.

Bibliography

1. Fiori E., *et al.* "Asymptomatic hyperuricemia: to treat or not a threat? A clinical and evidence-based approach to the management of hyperuricemia in the context of cardiovascular diseases". *Journal of Hypertension* 42.10 (2024): 1665-1680.
2. Rubio-Guerra AF., *et al.* "Effect of losartan combined with amlodipine or with a thiazide on uric acid levels in hypertensive patients". *Therapeutic Advances in Cardiovascular Disease* 11.2 (2017): 57-62.
3. Kuwabara M., *et al.* "Hyperuricemia, A new cardiovascular risk". *Nutrition, Metabolism and Cardiovascular Diseases* 35.3 (2025): 103796.
4. Zhang W. "Hyperuricemia: Current state and prospects". *Exploratory Research and Hypothesis in Medicine* 10.1 (2025): 49-55.

5. Rubio-Guerra AF, *et al.* "Correlation between levels of circulating adipokines and adiponectin/resistin index with carotid intima-media thickness in hypertensive type 2 diabetic patients". *Cardiology* 125.3 (2013): 150-153.
6. Sosa F, *et al.* "Impact of hyperuricemia and urate-lowering agents on cardiovascular diseases". *Clinical Medicine Insights: Cardiology* 18 (2024): 11795468241239542.
7. Kobayashi K, *et al.* "Impact of accumulated serum uric acid on coronary culprit lesion morphology determined by optical coherence tomography and cardiac outcomes in patients with acute coronary syndrome". *Cardiology* 141.4 (2018): 190-198.
8. Khameneh Bagheri R, *et al.* "Investigation of the association between serum uric acid levels and HEART risk score in patients with acute coronary syndrome". *Physiological Reports* 10.22 (2022): e15513.
9. Maloberti A, *et al.* "Uric acid in chronic coronary syndromes: relationship with coronary artery disease severity and left ventricular diastolic parameter". *Nutrition, Metabolism and Cardiovascular Diseases* 31.5 (2021): 1501-1508.
10. Maloberti A, *et al.* "Two still unanswered questions about uric acid and cardiovascular prevention: Is a specific uric acid cut-off needed? Is hypouricemic treatment able to reduce cardiovascular risk?" *Nutrition, Metabolism and Cardiovascular Diseases* 35.3 (2025): 103792.
11. Desideri G and Borghi C. "Xanthine oxidase inhibition and cardiovascular protection: Don't shoot in the dark". *European Journal of Internal Medicine* 113 (2023): 10-12.

Volume 13 Issue 10 October 2025

©All rights reserved by Alberto Francisco Rubio-Guerra, *et al.*