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Research Article

Role of Uric Acid as a Biomarker for Predicting Coronary Angiographic Severity in Acute Coronary Syndrome Patients

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Abstract:
Uric acid, a by-product of purine metabolism, has emerged as a potential biomarker for predicting cardiovascular disease severity, particularly in patients with Acute Coronary Syndrome (ACS). This study aims to evaluate the role of uric acid levels in predicting the severity of coronary artery disease (CAD) as determined by coronary angiography in ACS patients. A total of 150 patients diagnosed with ACS were included in the study. Serum uric acid levels were measured upon admission, and coronary angiography was performed to assess the severity of CAD using the Gensini score. The results showed a significant positive correlation between elevated uric acid levels and higher Gensini scores, indicating more severe coronary artery involvement. Uric acid levels were found to be an independent predictor of CAD severity, with a sensitivity of 75% and specificity of 70%. These findings suggest that uric acid could be used as a cost-effective and easily available biomarker to predict coronary artery disease severity in ACS patients, potentially aiding early clinical decision-making.
Keywords: Uric acid, biomarker, Acute Coronary Syndrome, coronary angiography, Gensini score, coronary artery disease.

Introduction

Acute Coronary Syndrome (ACS) encompasses a spectrum of clinical manifestations of coronary artery disease (CAD), including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). The severity of CAD, which can be evaluated through coronary angiography, directly impacts the prognosis and management strategies of ACS patients. (1) In recent years, there has been increasing interest in identifying biomarkers that can predict the extent of coronary artery involvement in ACS. Uric acid, a product of purine metabolism, has been proposed as one such biomarker.(2)

Uric acid is traditionally considered a waste product excreted by the kidneys. However, its role extends beyond this function, as it also serves as an antioxidant, though it may become pro-inflammatory at elevated levels (3). Increased serum uric acid levels have been associated with the development and progression of several cardiovascular conditions, including hypertension, atherosclerosis, and heart failure (4). Elevated uric acid levels have been shown to predict poor outcomes in patients with ACS, including higher risk for recurrent events, adverse left ventricular remodeling, and mortality (5).

The relationship between uric acid levels and the severity of CAD, however, remains controversial. Some studies suggest that elevated uric acid levels correlate with the severity of coronary artery lesions as determined by coronary angiography (6). The Gensini score,

which quantifies the severity and extent of coronary artery disease, has been widely used for this purpose. A positive correlation between serum uric acid levels and the Gensini score could provide a simple and effective way to predict the extent of coronary artery involvement, enabling more precise therapeutic strategies.

This study aims to investigate the role of uric acid as a predictor of coronary angiographic severity in ACS patients, with the hypothesis that higher uric acid levels will be associated with more severe CAD, as determined by the Gensini score.

Aim:

To assess the role of serum uric acid levels in predicting coronary angiographic severity in patients with Acute Coronary Syndrome (ACS).

Objectives:

1. To determine the correlation between serum uric acid levels and the Gensini score in ACS patients.
2. To evaluate the sensitivity and specificity of serum uric acid levels as a predictor of severe coronary artery disease in ACS patients.

Materials and Methods:

This was a, cross-sectional observational study conducted at a tertiary care hospital. A total of 150 patients diagnosed with Acute Coronary Syndrome, including STEMI, NSTEMI, and unstable angina, were enrolled in the study. The inclusion criteria included adult patients aged 40-80 years with a confirmed diagnosis of ACS and the availability of coronary angiography results. Exclusion criteria included patients with a history of gout, chronic kidney disease, active infections, or malignancy, as these conditions can independently influence uric acid levels.

Upon admission, demographic details, clinical history, and laboratory results were recorded. Serum uric acid levels were measured within 24 hours of admission using standard laboratory methods. Coronary angiography was performed for all patients, and the Gensini score was calculated to determine the severity and extent of coronary artery disease. The Gensini score is a widely accepted system that assigns points based on the location, severity, and extent of coronary artery stenosis. A higher Gensini score indicates more severe CAD.

Statistical analysis was performed to assess the correlation between uric acid levels and the Gensini score. Receiver operating characteristic (ROC) curves were generated to evaluate the diagnostic accuracy of uric acid levels in predicting severe CAD.

Results:

Table 1: Demographic and Clinical Characteristics of Study Patients

Characteristic	Value
Total Number of Patients (n=150)	150
Age (mean ± SD)	58 ± 9.5 years
Male/Female	90/60
Hypertension (%)	65%
Diabetes Mellitus (%)	52%
Smoking History (%)	40%

Table 2: Uric Acid Levels and Gensini Score in ACS Patients

Uric Acid Level (mg/dL)	Gensini Score (mean ± SD)
<6.0	25 ± 15
6.0 - 7.0	36 ± 18
>7.0	48 ± 22

The results showed a significant increase in the Gensini score as uric acid levels increased. Patients with uric acid levels above 7.0 mg/dL had the highest mean Gensini score (48 ± 22), indicating more severe coronary artery disease.

Table 3: Diagnostic Performance of Uric Acid as a Predictor of Severe CAD

Uric Acid Threshold (mg/dL)	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)
>6.0	78	65	72	71
>7.0	75	70	74	72

A uric acid threshold of >6.0 mg/dL showed good sensitivity and specificity for predicting severe CAD, with the highest accuracy at >7.0 mg/dL.

Discussion:

This study highlights the potential role of uric acid as a biomarker for predicting coronary artery disease severity in Acute Coronary Syndrome patients. We found a significant positive correlation between serum uric acid levels and the Gensini score, which measures the severity of coronary artery stenosis. As uric acid levels increased, the Gensini score also increased, suggesting that higher uric acid levels may be indicative of more extensive coronary artery disease (6).

Previous studies have indicated a link between elevated uric acid and the presence of coronary artery disease. In a study, elevated uric acid levels were associated with a higher risk of severe CAD in patients with ACS. Our findings align with these results, as we observed that patients with uric acid levels above 7.0 mg/dL had significantly higher Gensini scores, indicating more severe coronary involvement (7).

Furthermore, the diagnostic performance of uric acid levels as a predictor of severe CAD was evaluated. Uric acid levels above 6.0 mg/dL had a sensitivity of 78% and specificity of 65%, indicating that it could be used as an effective screening tool for identifying patients at risk of severe CAD. The predictive accuracy improved with a threshold of >7.0 mg/dL, with a sensitivity of 75% and specificity of 70%, making it a potentially useful biomarker for clinical practice (8-10).

However, it is important to note that uric acid levels alone may not be sufficient to predict CAD severity, and they should be used in conjunction with other clinical and diagnostic tools for comprehensive risk assessment. Further studies are needed to explore the exact mechanisms through which uric acid influences CAD progression and to determine optimal cutoff values for clinical use.

Conclusion:

Uric acid is a promising biomarker for predicting the severity of coronary artery disease in patients with Acute Coronary Syndrome. Elevated uric acid levels correlate with higher Gensini scores, indicating more extensive coronary involvement. Uric acid levels above 6.0 mg/dL are associated with a high sensitivity and specificity for identifying patients with severe CAD. Given its simplicity and low cost, serum uric acid measurement could be a valuable tool for clinicians in the early identification of high-risk ACS patients and in guiding therapeutic decision-making.

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