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# Molecular Markers in Peripheral Blood of Patient with Acute Myocardial Infarction

ORIGINAL

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## Abstract

**Aims:** Cyclooxygenases (COX) are involved in inflammation and in prostaglandin metabolism. It is estimated that the use of blockers causes a steep rise in cardiovascular events when compared with patients who did not use them. The aim of this report is to show the association of the increase in COX-2 expression in relation to time in a patient with acute myocardial infarction (AMI).

**Methods:** A 54-year-old black woman, hypertensive and ex-cocaine user, presented with typical precordial pain and ischemia in the anterior wall of the myocardium identified by an ECG. Serial blood collections were performed in order to evaluate COX-2 and NF-kB gene expressions. Forty days prior the event she had been submitted to percutaneous coronary angioplasty due to AMI. The coronarlography revealed stent thrombosis.

**Results:** COX-2 and NF-kB expressions peaked in the first 24 hours after the thrombotic event.

**Discussion:** There is an increase in COX-2 expression on atherosclerotic plaques. The use of COX-2 blockers increase the risk of ischemia given their vasoconstrictor effect, resulting in a decrease in oxygen supply to the myocardium. In sum, the increase in COX-2 expression was associated with acute coronary event in this patient.

**Keywords**
Cyclooxygenase; Acute Myocardial Infarction; Atherosclerosis.

## Introduction

Cyclooxygenases are enzymes directly involved in the inflammatory process. Once stimulated, the arachidonic acid is turned into prostaglandins by the cyclooxygenases. Prostaglandins, in turn, take part

in platelet activation, vasoconstriction, vascular endothelial regulation, gastrointestinal mucosal protection, brochodilation, kidney function and inflammatory processes. Recent studies have revealed an important association of COX-2 with cardiovascular protection. Shinmura demonstrated in unanesthetized mice that COX-2 acts in the regulation of these effects during a late stage of myocardial preconditioning. [1]

COX-2 blockers are presumed to cause a steep rise in cardiovascular events, like acute myocardial infarction and angina, when compared with patients who did not use them2. This effect suggests a protective effect of COX-2 in individuals who do not have it artificially inhibited, like when in use of NSAID [2].

NF-kB acts as a central signaling pathway of several other inflammatory pathways [3]. Thus, it jointly acts with the release of COX and its isoforms.

Myocyte cell death in acute myocardial infarction events may release fragments of DNA (DNA-free fraction in the plasma), and this fact may be related to a higher NF-kB expression with a consequent strengthening of this inflammatory pathway.

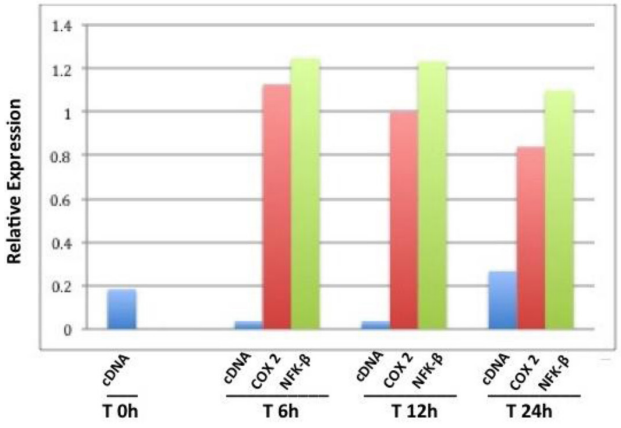
The aim of this report is to show the association of the increase in COX-2 expression in relation to time during the evolution of patient with acute coronary syndrome.

## Case Summary

A female fifty-three year old patient, smoker and hypertensive, regularly using enalapril and hydrochlorothiazide in optimal doses. An occasional cocaine user, the patient was admitted with typical precordial pain diagnosed as non-ST-segment elevation acute myocardial infarction. The case was analyzed by means of a coronary angiography, and a critical lesion in the medial segment of the left anterior descending artery was identified. Conventional stent angioplasty was performed and the patient was dismissed seven days later.

Forty-five days after first hospital admission, the patient returned with similar clinical features; however, this time the pain was more severe in the precordial region, and the diagnosis was ST-segment elevation anterior wall AMI, Killip class I. With the patient's consent, after the performance of a new contrast-enhanced coronary angiography, blood samples were collected at time points 0, 6, 12 and 24 hours on the second day after the AMI event. After blood collection, RNA was extracted and cDNA synthesis was performed. Next, cDNA was amplified to COX-2 and NF-kB gene expressions using their specific primers. The angiography revealed previously implanted stent thrombosis. The patient stated not having started the prescribed double antiaggregant therapy.

**Figure 1:** Analysis of COX-2 and NF-kB gene expressions in plasma DNA concentration in patient with acute coronary syndrome after the use of venous iodinated contrast.




## Discussion

Besides all the studies on the use of NSAIDs, others involving COX-2 polymorphisms, like the one conducted by Vogel [3], also suggest an important relation between COX-2 and acute coronary syndrome (ACS). The study showed that COX-2 polymorphism represents a higher risk of ACS, especially in males, which confirms this relation.

The current case report may be analyzed according to different perspectives: the difficulties patients face in adhering to the treatment due to socio-economic reasons that impact on specific medication acquisition; the event of post-angioplasty thrombosis and its differentiation from in-stent stenosis; the role of the contrast as an endothelial aggression factor due to its osmolarity and viscosity. COX-2 plays an important role in myocardial protection once it maintains the vasodilation necessary for the maintenance of myocardial oxygen supply [4, 5]. Its higher expression, as shown in this report, confirms the protective mechanism described above [5].

On the other hand, increased NF-kB expression confirms the inflammatory mechanism in AMI events. NF-kB plays different roles that regulate from pro-inflammatory to protective factors like the stimulus for nitric oxide synthase. [4]

A different behavior of the genes could be observed when the patient was diagnosed with non-ST-segment elevation AMI on her first admission, during which she underwent a contrast-enhanced angiography. Therefore, it may be inferred that the ST-segment elevation AMI event was the determinant factor for the peak detection of COX-2 and NF-kB gene expressions in patient undergoing ST-segment elevation AMI with stent thrombosis due to poor medication adherence after the performance of a coronary angiography.

In conclusion, COX-2 expression correlates with higher activity during AMI evolution as a protective response against ischemia.

## Conflict of Interests

No conflict of interests to report.

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