



## Dysrhythmias Induced by Streptokinase Infusion in Patients with Acute Myocardial Infarction Admitted to Cardiac Care Units in the Northwest of Iran

Razieh Parizad<sup>1</sup>, Mitra Mousavi Shabestari<sup>1\*</sup>, Sima Lak Dizaji, Maliheh Sehati<sup>1</sup>

### Abstract

**Objective:** Currently, the most common cause of death in the world is cardiovascular disease, particularly myocardial infarction. Myocardial infarction is caused by reducing or cutting off the blood supply to the heart muscle due to obstruction caused by the presence of plaque or thrombus. The first step for the treatment of acute myocardial infarction is using thrombolytic drugs. By the analysis of plaque and removing the blockage, the blood flows to the affected area again. The most important thrombolytic agent is streptokinase; however, in addition to its therapeutic effect it also has some complications and by identifying them mortality and disability can be prevented. The present study aimed to investigate the most common arrhythmia after infusion of streptokinase in patients with acute myocardial infarction (AMI).

**Materials and Methods:** This research was a descriptive study. The study population included patients admitted to the cardiac care unit of Shahid Madani Hospital, Tabriz, Iran, with a diagnosis of AMI from September 2012 until March 2014. Data were collected by using a checklist and the findings of the study were analyzed by SPSS software.

**Results:** Of the 116 hospitalized patients, 78 (67.5%) were male and 37 (32.5%) were female, and the largest percentage of infected patients was in the age group of 60-70 years [n = 38 (33%)]. Regarding cardiac risk factors, 57 (49%) of patients were hyperlipidemic, 36 (31%) were diabetic, 34 (30%) had high blood pressure, 25 (21%) were smokers, and 21 (18%) had a positive family history of cardiac problems. Patients who were admitted with a diagnosis of AMI, in 53 (46%) cases had streptokinase injection, and in 86 (74%) complications had occurred during drug injection; 87 (75%) patients had dysrhythmia and 29 (25%) had bleeding. Common dysrhythmia was premature ventricular contraction (PVC) with 90 (78.2%) cases. Moreover, 53 (46%) patients had slow ventricular tachycardia (VT), 18 (16%) had premature atrial contraction (PAC), and 5 (4%) had other arrhythmias. Mean of creatine phosphokinase (CPK) was 604, lactic dehydrogenase (LDH) 565.4, creatine phosphokinase mb (CKmb) 58.2, and cardiac troponin I (CTNI) 8.7.

**Conclusion:** By the timely referral of patients and knowledge of the nurses about complications of streptokinase, its side effects can be prevented.

**Keywords:** Acute Myocardial Infarction, Dysrhythmia, Streptokinase, Thrombolytic Therapy

### Introduction

Acute myocardial infarction (AMI) is one of the most common causes of hospitalization in the world. Approximately 1.1 million people in America suffer from this disease every year. AMI mortality rate is approximately 30% and more than half of these

deaths occur before arrival to the hospital. Over the past two decades, the mortality rate of AMI after being hospitalized has fallen more than 30%, despite this, almost 1 out of every 25 hospitalized patients who survive the first admission die every year. The survival rate of the elderly (more than 75 years of

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<sup>1</sup> Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

\*Corresponding Author: Mitra Mousavi Shabestari, Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, Iran  
Tel: +98 914310261, Email: mousavi sha@yahoo.com

age) has significantly declined. Mortality rates, one month and one year after AMI were 20% and 30%, respectively (1).

The rate of coronary heart disease (CHD) is growing every day and it is the leading cause of death and disability in developed countries (2). According to the Ministry of Health and Medical Education of Iran, 300,000 deaths annually are due to heart disease and about 4 million people live with its complications (3). With appropriate and timely treatment, the morbidity, mortality, admissions, and days of hospitalization of the patients can be decreased.

CHDs include: unstable angina (UA), ST-elevation myocardial infarction (STEMI), and non-ST elevation MI (NSTEMI) (4,5). Economic costs associated with ischemic heart diseases are high; about 60 billion dollars per year in the United States which includes prevention, treatment, and rehabilitation (6). The major arterial vessel is involved in this illness; by the blockage of this artery, CHD is developed. Myocardial infarction is a process in which some parts of the myocardial muscle are destroyed due to reduced coronary blood flow. Restoration of blood in these veins is a significant progress in treating this disease.

Immediate reperfusion (opening of blocked blood vessels) of ischemic myocardium could preserve it before leaving irreversible damages (7). The first step in the treatment of MI is using thrombolytic agents. The most important of these drugs is streptokinase (8). Appropriate thrombolytic therapy reduces infarct area, preserves left ventricular function, and reduces the rate of serious complications such as perforation of the valve, cardiogenic shock, and ventricular arrhythmias (9).

Myocardial infarction prognosis is mainly related to the two groups of side effects of:

1. Electrical complications
2. Mechanical complications

The majority of deaths caused by fibrillation occur within 24 hours after the onset of symptoms half of which occur in the first hour (10).

Thrombolytic therapy reduces mortality rate, length of hospitalization, and subsequent costs, and it is mostly performed when rapid access to percutaneous coronary intervention is not possible, but it is a bridge to future procedures for revascularization (Coronary Artery Bypass Graft, Percutaneous Coronary intervention) (11).

Due to the importance of thrombolytic therapy in patients with AMI and the need to have knowledge of its complications and since reviewing information resources showed that few consistent studies have been conducted on this matter, this study was performed. The overall objective of this study was to determine the dysrhythmia which occurs during and after streptokinase infusion in patients with AMI, and to improve nurses' knowledge on indications and complications of streptokinase.

### **Complications of thrombolytic therapy**

**Hemorrhage:** It was found that 70% of cases of hemorrhage occur in the blood vessels (12). Cerebral

hemorrhage is the most serious complication of thrombolytic therapy (13). Reperfusion injury, cell death, vascular injury, myocardial dysfunction due to intracellular biochemical changes, and dysrhythmia due to electrical instability can cause premature ventricular contraction (PVC), ventricular tachycardia (VT), and ventricular fibrillation (VF).

The incidence of VF after thrombolytic therapy is about 4.1% and VT 3.5%, and a combination of both about 2.7% (13). In-hospital mortality induced by VT was 18.6% and by VF was 44% (14). Systematic review of studies on thrombolytic therapy requires further investigation to identify its final using time, its use in average strokes, and environments in which it is more effective for routine thrombolysis operations (15).

### **Materials and Methods**

This was a descriptive study conducted from September 2012 until March 2014 on 116 patients hospitalized in Shahid Madani Hospital, Tabriz, Iran, with AMI diagnosis. Data was collected using a questionnaire and by interviewing the patients and the information was gathered in the patients' files. Cardiac markers, including cardiac enzymes and Troponin I, were measured by kit PARS Azmon and kit CTNi Monobind. This registry was designed to be compatible with current acute coronary syndrome (ACS) guidelines; UA is defined as angina pectoris (or equivalent type of ischemic discomfort) with at least one of the three following features:

- Being a new onset and severe
- Occurring at rest or with minimal exertion
- Occurring with a crescendo pattern

In the presence of at least two of the following, the diagnosis of MI was made:

- Characteristic symptoms
- Electrocardiographic changes
- Typical rise and fall in biochemical markers including cardiac troponins and CK-MB.

All statistical analyses were performed with SPSS for Windows (version 18, SPSS Inc., Chicago, IL, USA).

### **Results**

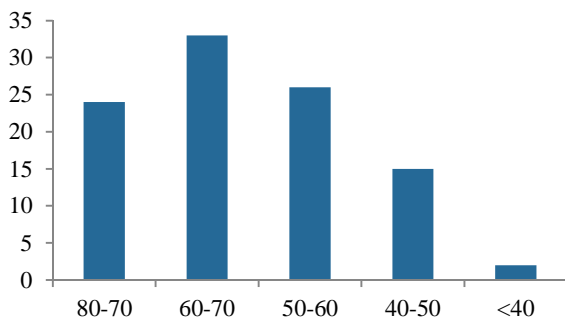
From a total of 287 patients, in 171 (59.5%) cases the diagnosis was UA, and data of the remainder of the cases (116 cases) was analyzed. The results showed that 78 (67.5%) patients were male and 37 (32.5%) were female, and 112 (96%) patients were married and 5 (4%) were single. Furthermore, 57 (49%) had hyperlipidemia, 36 (34%) had diabetes, 34 (30%) had hypertension, 5 (21%) were smokers, and 21 (18%) had a positive family history of heart disease (Table 1). The findings also showed that 88 (68%) patients had a history of hospitalization due to other causes, 91 (79%) patients had a history of heart disease, and 34 (30%) were admitted to the CCU for the first time. In addition, 110 (95%) patients were immediately visited after hospitalization, and 6 (5%) were visited one hour

**Table 1.** Baseline personal characteristics and risk factors of patients presenting with acute myocardial infarction

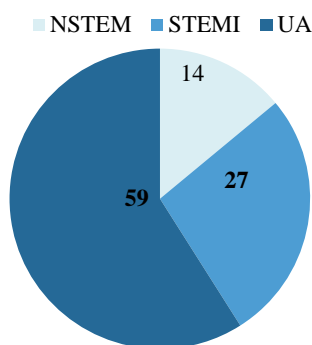
Characteristics	Frequency	Percentage (%)
Education		
Illiterate	60	52
Pre-university education	27	24
Diploma	18	16
University education	10	8
Risk factors		
Hyperlipidemia	57	49
Diabetes mellitus	36	31
Hypertension	34	30
Smoking	25	21
Positive family history	21	18

after admission. The age group of 60-70 years had the highest percentage of MI with 38 (33%) (Figure 1). Moreover, 51 (44%) patients were hospitalized during the night shift, 34 (29%) in the morning, and 29 (25%) during the evening shift.

Among the patients, 53 (46%) were hospitalized for 1-3 days, 33 (28.4%) for 4 days, 18 (16%) for 5 days, 9 (8.4%) for 6 days, and 2 (2%) were hospitalized for 7 days. In addition, 110 (95%) patients had the same final diagnosis as their first diagnosis, and only in 6 (5%) cases the diagnosis had changed. In 171 (59.5%) of all cases, patients were diagnosed with UA, 16 (14%) NSTEMI, 31 (27%) STEMI (Figure 2).



**Figure 1.** Age of patients with anterior myocardial infarction (AMI) (data are presented in percentage)

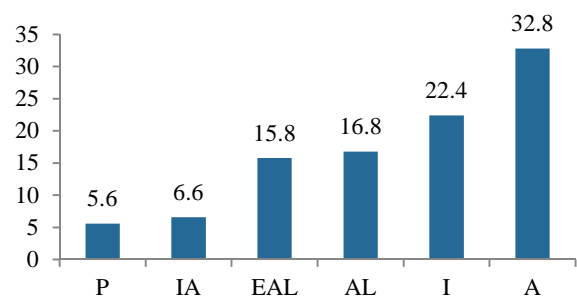


**Figure 2.** Type of acute coronary syndrome (data are presented in percentage)

NSTEMI: non-ST elevation myocardial infarction; STEMI: ST-elevation myocardial infarction; UA: unstable angina

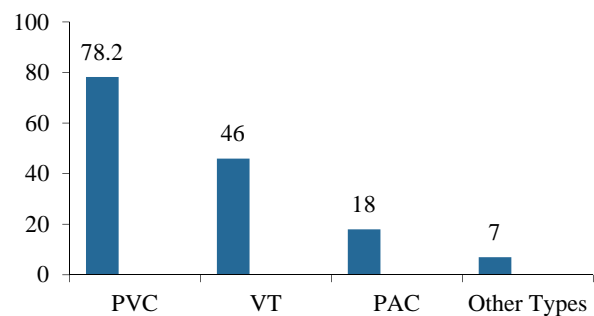
Among patients with STEMI, anterior MI was the most common type (n = 33; 32.8%), followed by inferior (n = 25; 22.4%), anterior lateral MI (n = 18;

16.8%), extensive anterior lateral MI (n = 17; 15.8%), inferior anterior MI (n = 7; 6.6%), and posterior MI (n = 6; 5.6%), respectively (Figure 3). In 53 (46%) patients, who were admitted with a diagnosis of AMI, streptokinase therapy was administered and in 86 (74%) patients complications had occurred during drug infusion. Dysrhythmia was observed in 98 (85%) patients and in 29 (25%) bleeding occurred. In all patients who received streptokinase the most common dysrhythmia was PVC with 90 (78.2%). In 53 (46%) patients slow VT, in 18 (16%) PAC, and in 5 (4%) other arrhythmias were observed (Figure 4). Mean of creatine phosphokinase (CPK) was 604, lactic dehydrogenase (LDH) 565.4, creatine phosphokinase mb (CKmb) 58.2, and cardiac troponin I (CTNI) 8.7 (Figure 5).



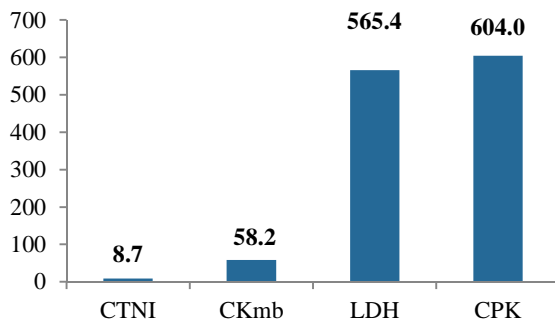
**Figure 3.** Location of myocardial infarction

A: Anterior myocardial infarction; I: Inferior anterior myocardial infarction; AL: Anterior lateral anterior myocardial infarction; EAL: Extensive anterior lateral myocardial infarction; IA: Inferior anterior myocardial infarction; P: Posterior myocardial infarction. (Data presented in percentage)



**Figure 4.** Type of dysrhythmia (data are presented in percentage)

PVC: Premature ventricular contraction; VT: Ventricular tachycardia; PAC: Premature atrial contraction



**Figure 5.** Mean of Cardiac Markers  
 CPK: Creatine phosphokinase; LDH: Lactic dehydrogenase; CKmb: Creatine phosphokinase mb; CTNI: Cardiac troponin I

## Discussion

This study aimed to evaluate dysrhythmia due to infusion of streptokinase in AMI treatment. Research showed that AMI is the most common type of MI. Arrhythmia occurring after infusion of streptokinase in the early hours of AMI treatment is extremely dangerous and life threatening for the patient and nurses are the first individuals to treat these patients. Thus, it is necessary to provide required trainings and educations for nurses regarding the complications of treatment with streptokinase and arrhythmias caused by it (16). This type of MI causes dangerous symptoms, such as cardiogenic shock, and nurses can provide appropriate interventions to accelerate the recovery process by identifying pre-shock symptoms. The study by Morris and Brady showed that about 1.3% of patients with myocardial infarction lose their lives before admission to hospital and in the early stages of hospitalization (17). According to this article, awareness of the disease process, dysrhythmia caused by thrombolytic therapy, and coping with them is vital and necessary. Furthermore, when streptokinase is administrated in first 1.5-3 hours after AMI, reperfusion occurs in more than 90% of the cases, and in case of delay in treatment, the prognosis is worsened (18).

In the studied center, 116 (41%) hospitalized patients were diagnosed with MI, and 171 (59.5%) of the patients were diagnosed with UA. The incidence of MI was prevented by hospitalizing patients with UA diagnosis. The study by Cercek et al. showed that ventricular arrhythmias occur mostly in 8 to 12 hours after reestablishing blood flow and rarely occur at discharge (19). The golden time of streptokinase infusion in the treatment of AMI is important, and timely referral of the patient has an important part in an effective treatment (16,19). Educating patients on cardiac diseases, the need for rapid referral to treatment centers, and streptokinase injection in the prevention of myocardial necrosis, which causes the rehospitalization of patients and chronicity of the disease, is of great importance.

## Conclusion

Given the widespread use of streptokinase in

patients with AMI, mechanical and electrical cardiac complications can be prevented and morbidity and mortality rates, length of hospitalization, and the cost of treatment can be reduced through the prompt referral of the patients, and nurses' awareness of streptokinase infusion complications.

## Ethical issues

Written informed consent was obtained from the patients for publication of this study. In addition, the study has been approved by the local ethics committee.

## Conflict of interests

We declare that we have no conflict of interests.

## Acknowledgments

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