Chapter 15 / Capítulo 15

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Outcome of percutaneous coronary intervention after successful fibrinolysis

Resultado del intervencionismo coronario percutáneo tras una fibrinólisis exitosa

Lázaro Alejandro Sánchez Blanco[1], Juana Mirtha Gonzales Ferrer[1]

[1]Universidad de Ciencias Médicas, Facultad N°1 de Medicina. Santiago de Cuba, Cuba

Corresponding author: Lázaro Alejandro Sánchez Blanco

ABSTRACT

Introduction: acute myocardial infarction is the leading cause of death in developed countries and the third leading cause of death in developing countries. Primary percutaneous coronary intervention is the treatment of choice for STEMI; however, this treatment is not always the quickest option.
Objective: to describe the outcomes of percutaneous coronary intervention following successful fibrinolysis in patients with acute myocardial infarction.
Method: cross-sectional study of patients with acute myocardial infarction treated at the "Saturnino Lora Torres" Provincial Hospital in Santiago de Cuba, during the period from January 2024 to September 2025. Patients were selected through a non-probabilistic, purposive sampling method.
Results: a total of 102 patients who underwent percutaneous coronary angioplasty after successful fibrinolysis were studied. The mean age was 57 years, with a predominance of males (70 %). Mestizos accounted for 76 %, and 94 % were from Santiago de Cuba. The main risk factors were arterial hypertension (49 %), smoking (45 %), and diabetes mellitus (35 %). Aspirin was used by 78 % of patients as part of their treatment, followed by ACE inhibitors in order of frequency. Precordial pain was reported in 91 % of patients and dyspnea in 67 %. The most frequent topographic presentations were anterior (35 %), inferior (33 %), and extensive (18 %). Fifty-nine percent had only one affected vessel, so 86 % received treatment on only one vessel, and a single stent was placed in 78 % of the total cases.
Conclusions: The results show ongoing deficiencies in the adequate treatment of patients with myocardial infarction, related to time loss in primary centers. Nonetheless, the outcomes are similar to studies conducted in developed settings.

Keywords: Acute Myocardial Infarction; Percutaneous Coronary Angiography; Fibrinolysis.

RESUMEN

Introducción: el infarto agudo de miocardio es la principal causa de muerte en países desarrollados y la tercera causa de muerte los que se encuentran en vía de desarrollo. La intervención coronaria percutánea primaria es el tratamiento de elección en el IAMCEST, no obstante, este tratamiento no es siempre la opción más rápida.

Objetivo: describir los resultados en la aplicación de intervencionismo coronario percutáneo tras fibrinólisis exitosa en pacientes con infarto agudo de miocardio.
Método: estudio transversal en pacientes con infarto agudo de miocardio atendidos en el Hospital Provincial "Saturnino Lora Torres" de Santiago de Cuba, en el período comprendido desde enero de 2024 hasta septiembre 2025. Los pacientes fueron escogidos mediante un muestreo no probabilístico de tipo intencionado.
Resultados: se estudiaron 102 pacientes que recibieron angioplastia coronaria percutánea tras fibrinólisis exitosa. La edad promedio fue de 57 años, con predominio de masculinos (70 %). Los mestizos representaron el 76 %, y los procedentes de Santiago de Cuba el 94 %. Los principales factores de riesgo fueron la hipertensión arterial (49 %), el tabaquismo (45 %) y la diabetes mellitus (35 %). El 78 % de los pacientes usaban aspirina como parte de su tratamiento, seguidos por los IECAs en orden de frecuencia. El dolor precordial se encontró en el 91 % de los pacientes y la disnea en el 67 %. Las presentaciones topográficas más frecuentes fueron anteriores (35 %), inferior (33 %) y extenso (18 %). El 59 % tenían solo un vaso afectado, por lo que el 86 % recibió tratamiento solamente en un vaso, y se colocó un solo *stent* en el 78 % del total.
Conclusiones: los resultados encontrados demuestran insuficiencias aún en el tratamiento adecuado de los pacientes con IAM, relacionado con la pérdida de minutos en los centros primarios. De cualquier modo, los resultados son similares a estudios realizados en contextos desarrollados.

Palabras clave: Infarto Agudo de Miocardio; Angiografía Coronaria Percutánea; Fibrinolisis.

INTRODUCTION

Population growth, increased life expectancy, improved development conditions, and new lifestyles have led to changes in the epidemiology of causes of death in modern societies. However, since the beginning of the 21st century, cardiovascular diseases have been the leading cause of death and disability worldwide, accounting for 17,3 million deaths in 2008, 19,4 million in 2015, and a projected 23,6 million in 2030. Of these, the most important in terms of frequency is ischemic heart disease, which causes 15,6 % of all deaths (Callea et al., 2012; Ralapanawa et al., 2019; Virani et al., 2020).

Ischemic heart disease is considered a global public health problem, as it affects 1 % of the population. Its significant impact on mortality continues to this day. In fact, in the United States, it is estimated that 35 % of people who suffer some coronary event will subsequently die from it (World Health Organization, 2012).

The World Health Organization (WHO, 2012) states that for years, atherosclerotic heart disease has been one of the main complications of atherosclerosis, and its manifestation as acute myocardial infarction (AMI) has the greatest impact on public health. The annual number of deaths due to cardiovascular disease is expected to increase from 17 million in 2008 to 25 million in 2030. In Europe, there has been a general downward trend in mortality from coronary heart disease over the last three decades. It currently causes almost 1,8 million deaths per year, accounting for 20 % of all deaths in the region, with large variations between countries (Hartley et al., 2016; Townsend et al., 2016). On the other hand, in terms of the economic impact of cardiovascular disease on public health systems, acute myocardial infarction costs € 192 billion per year, 57 % of which is for healthcare, 21 % for lost productivity, and 22 % for indirect costs (Callea et al., 2012; Ralapanawa et al., 2019; Virani et al., 2020).

Acute myocardial infarction is the leading cause of death in developed countries and the third leading cause of death in developing countries. In countries in the Americas, such as the United States, it is estimated that nearly 500 000 deaths each year are caused by this disease, and its probability of occurrence increases with age (Bharadwaj et al., 2020; Guzik et al., 2020; Mozaffarian et al., 2016; Reyes & Lilia, 2021; World Health Organization, 2012). Other nations on the continent, such as Mexico, list it as their leading cause of death (Estadísticas en Salud, 2021; Reyes & Lilia, 2021).

In Cuba, heart disease was the leading cause of death in 2019, with 26 736 deaths, for a rate of 238,1 per 100 000 inhabitants. There were 16,397 deaths from ischemic heart disease, with a rate of 146,0, and specifically from acute myocardial infarction, there were 7 248 deaths, with a rate of 64,6 per 100 000 inhabitants (Estadísticas en Salud, 2021). The term acute myocardial infarction should be used when there is evidence of myocardial damage (defined as an elevation of cardiac troponins to values above the 99th percentile of the upper reference limit), with the presence of necrosis in a clinical context compatible with myocardial ischemia (Thygesen et al., 2018).

To initiate treatment strategies immediately, such as reperfusion, patients with ST-segment elevation myocardial infarction (STEMI) are typically designated as those with persistent chest pain or other symptoms indicative of ischemia and ST-segment elevation in at least 2 contiguous leads. In contrast, those without ST-segment elevation are designated as patients with non-ST-segment elevation myocardial infarction (NSTEMI; Thygesen et al., 2018).

The global pandemic caused by SARS-CoV-2 has led to new changes in emergency systems designed to provide effective PCI in patients with ST-segment elevation myocardial infarction. Therefore, there has been renewed interest in fibrinolysis for STEMI, as it provides rapid reperfusion in selected patients (Ibanez et al., 2018).

Considering all the above and the fact that our country is no exception to the current medical situation, our healthcare professionals apply the best reperfusion strategy for STEMI, considering sociodemographic and logistical factors, ensuring compliance with the principles of Cuban healthcare to provide quality care to the entire population. One of the most widely used strategies is pharmacoinvasive therapy, which raises the following scientific question:

What are the results of percutaneous coronary intervention after successful fibrinolysis in patients with acute myocardial infarction treated at the Saturnino Lora Torres Provincial Hospital in Santiago de Cuba, from January 2024 to September 2025?

Justification of the problem:

Percutaneous coronary intervention (PCI) after successful fibrinolysis is a key strategy in the management of ST-segment elevation acute myocardial infarction, which seeks to improve reperfusion and reduce complications. However, evidence on its results in the specific context of the Saturnino Lora Torres Provincial Hospital in Santiago de Cuba during 2024-2025 is limited, making it difficult to optimize the local clinical approach. This study is necessary to evaluate the clinical outcomes of PCI post-r-fibrinolysis in patients at this institution, providing fundamental data to improve care protocols and patients' quality of life. In addition, it will strengthen evidence-based medical decision-making and promote best practices in the treatment of acute myocardial infarction in the regional setting.

Objective

To describe the results of percutaneous coronary intervention after successful fibrinolysis in patients with acute myocardial infarction.

METHOD

An observational, descriptive, cross-sectional study was conducted to describe outcomes of percutaneous coronary intervention following successful fibrinolysis in patients with acute myocardial infarction treated at the Saturnino Lora Torres Provincial Hospital in Santiago de Cuba, from January 2024 to September 2025.

The study population consisted of all patients over 18 years of age diagnosed with ST-segment elevation myocardial infarction (STEMI) treated at the Cardiology and Cardiovascular Surgery Center of the Saturnino Lora Torres Provincial Hospital in Santiago de Cuba during the defined period and who had received fibrinolysis and percutaneous coronary intervention. Patients were selected using intentional non-probabilistic sampling, and the sample size was calculated using the EpiCalc calculator in Epi Info 7.2 at a 95 % confidence level. Patients with incomplete medical records that did not allow the necessary information for the research to be collected were excluded. No exit criteria were established because the study was retrospective and did not require follow-up.

RESULTS

Table 1 shows the distribution of patients studied by age group and sex; by age, patients were classified into 10-year groups, with a lower age limit of 41 years. There was a clear predominance of male patients aged 50 or older (over 70 % of the total). Patients aged 61-70 were the most represented among females (50 % of this group). Patients aged 70 or older accounted for only 9 % of the total patients studied.

Table 1. Distribution of patients undergoing percutaneous coronary intervention after successful fibrinolysis by age and sex. Saturnino Lora Torres Provincial Hospital, Santiago de Cuba, January 2024–September 2025

Age	Sex				Total
	Male		Female		
	No.	%	No.	%	
41-50	26	35,1	4	14,3	30
51-60 years	22	29,7	6	21,4	28
61-70 years	20	27,0	14	50	34
Over 70	6	8,1	4	14,3	10
Total	74	100	28	100	102

Patients with mixed-race skin color were the most represented in the general population, accounting for almost 77 % of the total. This corresponds to the general mixed-race nature of the Cuban population, which is even more pronounced in the region where the study was conducted. This has no impact on the results found.

In terms of distribution by province, patients from Santiago de Cuba predominated, accounting for almost 95 % of the total. This result is consistent with the province of Santiago de Cuba's higher population density, coupled with the fact that the research was conducted in the city where the center is located. Although it covers the five eastern provinces, many citizens of Holguín and Granma prefer to go to the Las Villas Cardiology Center or even the Cardiology

Institute in Havana.

Table 2. Distribution of patients studied according to skin color

Skin color	No.	%
White	14	13,7
Black	10	9,8
Mixed	78	76,5
Total	102	100

Table 3. Distribution of patients studied according to province of origin

Province of origin	No.	%
Granma	2	2
Santiago de Cuba	96	94,1
Guantánamo	4	3,9
Total	102	100

Risk factors for cardiovascular disease are very common in the Cuban population, and their distribution is similar to that in developed countries. Hypertension and diabetes mellitus were the most common diseases, with 49 % and 35 %, respectively. Smoking was the predominant habit in more than 45 % of those studied. At the same time, it is striking that more than 20 % of patients were obese.

Table 4. Distribution of patients according to risk factors found

Risk factors	No.	%
High blood pressure	50	49,0
Diabetes mellitus	36	35,3
Peripheral arterial disease	18	17,6
Dyslipidemia	28	27,5
Smoking	46	45,1
Alcoholism	15	14,7
Obesity	21	20,6

Almost 80 % of patients had aspirin included in their treatment upon admission. ACE inhibitors were the second-most-frequently used drugs (44 % of the total)

Table 5. Distribution of patients according to medical treatment upon admission

Medications	No.	%
Aspirin	80	78,4
Clopidogrel	7	6,9
Beta-blockers	16	15,7
ACE inhibitors	45	44,1
Diuretics	12	11,8

The most frequent location of infarction in this study was anterior, accounting for 35,3 % of all events. This was followed by inferior location (33,3 %), while the least represented were anterocephalic and posterior (2 % in each case).

Table 6. Patients according to topographic diagnosis of infarction		
Topographic diagnosis	**No.**	**%**
Anterior	36	35,3
Anteroceptal	2	2,0
Inferior	34	33,3
Posterior	2	2,0
Posterior inferior	10	9,8
Extensive	18	17,6
Total	102	100

Table 7 shows the results for patients according to angiographic characteristics. As can be seen, patients with single-vessel involvement predominated (58,8 %); coincidentally, 86 % of cases received single-vessel treatment, and 82 single lesions were treated, accounting for 80 % of the total. Finally, only one coronary stent was placed in 78 % of the patients studied.

Table 7. Angiographic characteristics of the patients studied		
	No.	**%**
Diseased vessels		
None	8	7,8
One vessel	60	58,8
Two glasses	22	21,6
Three glasses	12	11,8
Treated glasses		
None	12	11,8
One vessel	88	86,3
None	2	2,0
Injuries treated		
None	12	11,8
One injury	82	80,4
Two injuries	8	7,8
Number of stents		
None	12	11,8
One stent	80	78,4
Two stents	8	7,8
Three stents	2	2,0

CONCLUSIONS

The results confirm that the drug-invasive strategy (percutaneous coronary intervention – PCI – after successful fibrinolysis) is an applicable and effective treatment option for acute myocardial infarction at the Saturnino Lora Torres Provincial Hospital. The study population was predominantly male and had a high incidence of classic risk factors (hypertension and smoking).

From an angiographic perspective, most patients presented with single-vessel involvement, which facilitated treatment. However, the main weakness identified was the logistical delay in the care system, with a door-to-balloon time of 122 minutes. This delay, attributed to the prehospital phase and transfers, is significantly longer than recommended.

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