CorSalud 2015 Jul-Sep;7(3):187-194

CorSalud

Cuban Society of Cardiology

Original Article

Cardiocentro Ernesto Che Guevara Santa Clara Cuba

Thrombolytic therapy and acute myocardial infarction at the Military Hospital of Matanzas

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Este artículo también está disponible en español

ARTICLE INFORMATION

Received: December 9, 2014
Accepted: 14 January 2015

Competing interests
The authors declare no competing interests

Acronyms
AMI: acute myocardial infarction
PMH: past medical history
STEMI: ST segment elevation myocardial infarction

On-Line Versions:
Spanish - English

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ABSTRACT

Introduction: Heart disease is the leading cause of death in Cuba.

Objective: To identify clinical and epidemiological characteristics in patients with acute myocardial infarction and its link with thrombolysis.

Method: A descriptive, cross-sectional study was performed at the Military Hospital of Matanzas, in the period between January 2011 and January 2013. The study group was 96 patients with electrocardiogram diagnosis of ST segment elevation acute myocardial infarction.

Results: There was a predominance of males (61.6%), and patients between 65 and 74 years (39.6%) were the most affected age group. Hypertension was the leading risk factor found (71.9%). In 60.2% of patients who received thrombolytic therapy, door-to-needle time was between 30 and 60 minutes, and most of them [34 (35.4%)] arrived at the hospital within 2 to 6 hours from the onset of symptoms. Pain relief and ST return occurred in 100% of effective thrombolysis. The most common reason for lack of thrombolysis was the progress of the condition of more than 12 hours, and 33.3% of patients who did not receive thrombolytic therapy died.

Conclusions: Males, ages between 65 and 74, and high blood pressure predominate. Most of patients received thrombolysis, had pain-to-door time between 3-6 hours, and door-to-needle time between 30-60 minutes. Hypotension was the most frequent complication during thrombolysis. This procedure was not performed when pain-to-door time was longer than 12 hours, where deaths predominated. Timely thrombolysis remains the main tool to increase the survival in patients with acute myocardial infarction, in hospitals without percutaneous coronary intervention.

Key words: Acute myocardial infarction, Thrombolytic therapy, Recombinant streptokinase

Terapia trombolítica e infarto agudo de miocardio en el Hospital Militar de Matanzas

RESUMEN

Introducción: Las enfermedades del corazón constituyen la principal causa de muerte en Cuba.

Objetivos: Identificar las características clínico-epidemiológicas de los pacientes con infarto agudo de miocardio y su vínculo con la trombólisis.
Método: Estudio observacional descriptivo, de corte transversal, en el Hospital Militar de Matanzas, entre enero de 2011 y enero de 2013. El universo de estudio fue de 96 pacientes con diagnóstico clínico y electrocardiográfico de infarto agudo de miocardio con supradesnivel del segmento ST.
Resultados: Existió predominio del sexo masculino (61,4 %), el grupo etario más afectado fue entre 65 y 74 años (39,6 %). La hipertensión arterial constituyó el principal factor de riesgo encontrado (71,9 %). En el 60,2 % de los pacientes que recibieron tratamiento trombolítico, el tiempo puerta-aguja fue entre los 30 y 60 minutos, y la mayoría de los casos [34 (35,4 %)] arribaron al hospital entre las 3 y 6 horas del inicio de los síntomas. El alivio del dolor y el regreso del ST se presentaron en el 100 % de las trombólisis efectivas. La causa más frecuente de no trombólisis fue la evolución del episodio isquémico mayor a 12 horas, y falleció un 33,3 % de los pacientes que no recibieron tratamiento trombolítico.
Conclusiones: Predominaron el sexo masculino, las edades entre 65 y 74 años, y la hipertensión arterial. La mayoría recibió trombólisis, con tiempo dolor-puerta entre 3 y 6 horas, y puerta-aguja entre 30 y 60 minutos. La complicación que más se presentó durante la trombólisis fue la hipotensión arterial y la causa más frecuente de no realización del procedimiento fue el tiempo dolor-puerta mayor a 12 horas, donde predominaron los fallecimientos. La trombólisis oportuna sigue siendo la principal herramienta para elevar la supervivencia de los pacientes con infarto agudo de miocardio en hospitales sin intervencionismo coronario percutáneo.
Palabras clave: Infarto agudo de miocardio, Trombólisis, Estreptoquinasa recombinante

INTRODUCTION

Ischemic heart disease, called by many "the scourge of modern life"[1], causes more deaths, disability and has higher economic costs than any other disease in developed countries[2]. About 30% of all deaths that occur worldwide each year are attributable to cardiovascular disease. It is estimated that 18.1 million people died from these causes in 2010, of which 80% lived in low and middle income countries[3].

In Latin America, about 40% of these deaths occur prematurely, at the most productive time of life, and it is estimated that cardiovascular diseases will cause three times more deaths and disabilities than infectious diseases[4].

Heart disease is the leading cause of death in Cuba. Cuban studies[1,5] indicate that the high mortality rate is due mainly to the high mortality from acute myocardial infarction (AMI). In the last five years, only for this reason, more than 22 000 people died annually, of which 41.2% was in the population under 75 years of age. A high proportion of them (38.8%) died in their homes. Matanzas Province ranked first with 1 781 deaths. The annual rate of AMI in Matanzas province was 68.6 per 100 000 inhabitants, and according to the different municipalities, the highest rates were for Matanzas, Union de Reyes and Cárdenas[5].

There has been an increase in the incidence of AMI in the Military Hospital of Matanzas[6]. In the late 70s thrombolytic therapy (intracoronary and systemic) was included as primary treatment for AMI[7]. Multicenter studies have shown that intravenous thrombolytic therapy in patients with AMI can reduce mortality by 20 to 50%, depending on the time elapsed from the onset of symptoms and the implementation of treatment[8]. It has been estimated that 86% of deaths averted after the introduction of thrombolysis can be attributed to this treatment and the use of antiplatelet agents[9].

The lack of knowledge about the characteristics that determine the behavior of thrombolysis in the Military Hospital of Matanzas, and the causes of not using it were the reasons for this study which was conducted in order to identify the clinical and epidemiological characteristics of patients with AMI and its link with thrombolysis.

METHOD

A cross-sectional, observational descriptive study was conducted at the Dr. Mario Muñoz Monroy Military Teaching Hospital, in the province of Matanzas, from January 2011 to January 2013.

The universe consisted of 96 patients with clinical and ECG diagnosis of AMI with ST segment elevation (STEMI) or left bundle branch block of new appearance, plus ischemic chest pain 30 minutes or longer, or an equivalent syndrome with suspicion of AMI, initiated within the previous twelve hours.

The following variables were included: age, sex, past medical history (PMH) or associated risk factors, thrombolysis, door-to-needle time, time elapsed from the onset of symptoms to the arrival at hospital, reperfusion criteria, effectiveness of thrombolysis, causes for not implementing thrombolysis, complications, adverse reactions and status of the patient at discharge.

Statistical data were obtained from medical records. The information was then collected on a form devised for this purpose.

Table 1. Distribution of patients by age group and sex. Dr. Mario Muñoz Monroy Military Hospital, Matanzas, 2011-2013.

Age group	Sex				Total	
	Male		Female			
	Nº	%	Nº	%	Nº	%
44 - 54	13	22.0	3	8.1	16	16.7
55 - 64	15	25.4	13	35.1	28	29.1
65 - 74	22	37.3	16	43.2	38	39.6
75 and over	9	15.3	5	13.5	14	14.6
Total	59	61.4	37	38.5	96	100

Source: Personal Medical Records

Table 2. Distribution of patients according to PMH and coronary risk factors (n=96).

PMH and risk factors	Sex				Total	
	Male		Female			
	Nº	%	Nº	%	Nº	%
Hypertension	38	39.6	31	32.3	69	71.9
Smoking	31	32.3	23	24.0	54	56.3
Ischemic heart disease	26	27.1	22	22.9	48	50.0
Hyperlipidemia	22	22.9	19	19.7	41	42.7
Diabetes mellitus	15	15.6	12	12.5	27	28.1
Obesity	11	11.5	7	7.3	18	18.8

Procedures

A step by step description of the study variables was conducted; some of them were linked in bivariate analysis in contingency tables devised for this purpose.

A database with the information collected was created and processed through the SPSS software version 11.0, allowing statistical analysis and the preparation of tables with the results, which are expressed in numbers and percentages.

Standards of medical ethics for conducting this investigation were met.

RESULTS

Table 1 shows that in the 96 patients with STEMI the most prevalent age group was that from 65 to 74 years, accounting for 39.6%, in which range the largest number of females affected was found, with 16 patients, for 43.2%; however, in general there was a prevalence of men (61.4%).

Hypertension was present in 69 of these patients with STEMI (71.9%), and was the most common risk factor found (**Table 2**), followed by smoking (56.3%). During the primary data collection it was noted that there were several coronary risk factors in almost all patients, with an average near to 2 per patient.

Among the patients who received thrombolytic therapy (**Table 3**), 47 (60.2%) had a door-needle time between 30 and 60 minutes, which in turn was the most used therapeutic range. The prevailing time between the onset of symptoms and arrival at the hospital was from 3 to 6 hours in 32 patients (41%). Of the 18 patients who did not receive thrombolysis, 61% arrived at the hospital after the first 12 hours of symptom onset.

Table 4 shows a predominance of effective thrombolysis, based on the presence of reperfusion criteria in 69 patients, 84.4%. Within the first 2 hours from the onset of symptoms to the arrival at the hospital, a 100% success rate was achieved in those who received this type of treatment.

Table 3. Distribution of patients according to the time delay from the onset of symptoms and arrival at the hospital, and door-to-needle time.

Time between onset of symptoms and arrival at hospital (hours)	Thrombolytic treatment										Total	
	Yes (n = 78)								No (n = 18)			
	Door-to-needle time (minutes)						Total					
	< 30		30 – 60		> 60							
	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
< 1	2	2.6	7	9.0	2	2.6	11	14.1	0	-	11	11.5
1 – 2	3	3.8	16	20.5	6	7.7	25	32.1	2	13.3	27	28.1
3 – 6	5	6.4	19	24.4	8	10.3	32	41.0	2	13.3	34	35.4
7 – 12	2	2.6	5	6.4	3	3.8	10	12.8	3	16.6	13	13.5
> 12	0	-	0	-	0	-	0	-	11	61.1	11	11.4
Total	12	15.4	47	60.2	19	24.3	78	100	18	100	96	100

It was also noted that after 3 hours the failed category began to appear, which reaches its highest value after seven hours in 10.3% of patients.

Figure 1 shows the distribution of patients in relation to the causes for not performing thrombolytic therapy for STEMI. Thrombolysis was no performed in 18 patients, and the main cause was symptom duration for more than 12 hours, with late arrival at health care units in 11 patients (61.1%) followed by ischemic cerebrovascular disease of less than 6 months, accounting for 11.1%. In the study, patients did not have more than one cause for not receiving the procedure.

Table 4. Distribution of patients according to the time delay from the onset of symptoms and arrival at the hospital, and the effectiveness of thrombolysis.

Time from the onset of symptoms and arrival at the hospital (hours)	Thrombolysis				Total	
	Effective		Failed			
	Nº	%	Nº	%	Nº	%
< 1	11	14.1	0	-	11	14.1
1 – 2	25	32.1	0	-	25	32.1
3 – 6	31	39.7	1	1.3	32	41.0
7 – 12	2	2.6	8	10.3	10	12.8
Total	69	88.5	9	11.5	78	100

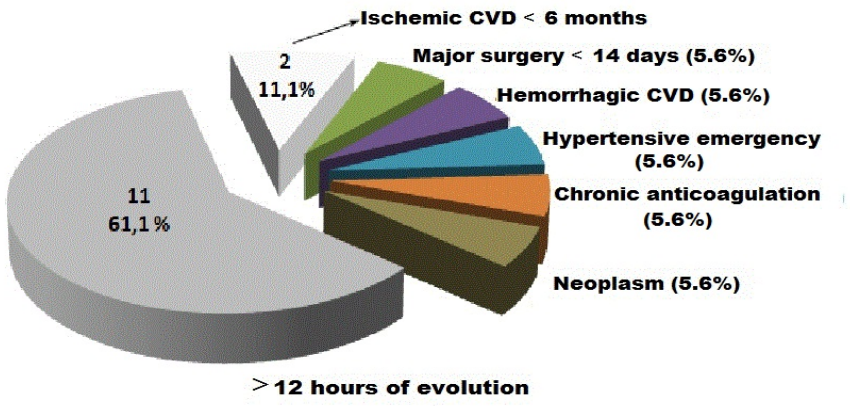

Figure. Distribution of patients according to causes contraindicating thrombolysis. CVD: cerebrovascular disease.

Table 5 shows the relationship between thrombolytic therapy and discharge status, where a smaller proportion of deaths is observed in patients receiving this treatment (11.5 %), compared to those who did not received it irrespective of the causes (33.3%).

DISCUSSION

With regard to gender, the reviewed literature states that acute coronary syndrome (ACS) occurs more frequently in men than in women until menopause. After it, the inci-

Table 5. Distribution of patients according to thrombolysis and discharge status.

Thrombolysis	Discharge status				Total	
	Alive		Deceased			
	Nº	%	Nº	%	Nº	%
Yes	69	88.5	9	11.5	78	81.2
No	12	66.7	6	33.3	18	18.8
Total	81	84.4	15	15.6	96	100

dence of the disease rises in females. The estrogenic defense during active sexual stage prevents or delays the onset of atherosclerotic lesions, since the endogenous estrogen protects the blood vessel endothelium, and it is also noted that these hormones decrease serum lipids[10].

Other studies has shown results that are similar to ours, and state that the AMI is more common in males, although there is an increase of the disease in women with increasing age, due in part to the loss of estrogen protection in them at this stage of life[11]. According to Jimenez-Navarrete[12], in a study of AMI underreporting in Costa Rica, in a sample of 138 patients: 108 were men (78.1%) and 30 women (21.9%). The average age of the sample was 65.2 years (60.8 for men and 65.2 for women). The ages with a higher number of infarction patients were 50 to 59 years and ≥ 70 years (both 29%).

In Cooper's study[13], lethality remains high in ischemic heart disease, and most patients were male. It is noted that the lethality of this disease varies considerably between countries. A mean of 49.0 % was found among men and 53.8% among women.

The results are similar to those raised by Nunez *et al*[14], who attach great importance to age regarding the onset of AMI after 50 years of age. These results also agree with those raised in the study conducted by Rodríguez[15], when referring to the changes caused by age in cardiac morphology and functioning.

AMI occurs most often in the sixth decade of life. It is reported that 80% occurs in middle-aged individuals and the elderly[16-17]. A study by León-Latre[18] showed that the mean age of the patients ranged from 61 to 67 years.

The authors believe that this behavior may be caused, among other things, by the increase in life expectancy and the increase in the occurrence of atherogenic risk factors reaching higher levels after the fifth decade of life, which coincides with postmenopausal period in women.

Hypertension is considered a disease and an established and independent coronary risk factor, as there is a great risk-disease association and its cause-effect relation is proven[19]. Similar results were obtained by Baena *et al*[20], where the prevalence of hypertensive patients was over 50% in those with ischemic heart disease. The statistics have shown that the mortality of patients with hypertension due to heart disease is seven times higher than normal as a result of the changes in the coronary vasculature and the appearance of myocardial injury[13,21].

The time elapsed from the onset of symptoms and the application of thrombolytic therapy is an important factor, especially when you consider that the benefit of reperfusion is a consequence of the early opening of the affected artery. Research on the subject has shown that if the thrombolytic treatment is applied before three hours of the onset of symptoms, mortality rate is 3.4%. However, in those patients who received it in the range of 4 to 6 hours and 7 to 9 hours mortality was 6.8% and 12.8%, respectively; the highest mortality rate occurred in patients receiving this treatment after 10-12 hours[22].

Viera *et al*[23] argued that the delay in the hospital, that is, the interval between hospital arrival and diagnosis with the initiation of a specific therapy is another problem affecting hospitals around the world, including those of developed countries. In the Spanish study by Alconero-Camarero *et al*[24], it was reported that the total delay time in STEMI was 60 min, and the median delay in the transfer was 27-28 min, in both sexes.

González *et al*[25] claim that prehospital delay (delay of a patient with acute coronary syndrome to go to an emergency department) is a worldwide problem and is responsible for approximately 50% of deaths from AMI.

The causes of prolonged delay were analyzed by Rodriguez *et al*[26]. They found a prevalence of patient's ignorance of the warning signs, with 67.4%, followed by a low perception of risk by the physician of primary health care, with 13.9%. The areas of difficult access and a low perception of risk by the physician at the secondary health care had little statistical significance.

The authors consider that there are the necessary conditions at the Military Hospital of Matanzas for

performing thrombolysis in a 100% of cases with door-to-needle time less than 30 minutes, because there is a qualified staff and there are the necessary means for it. However it is important sensitize the staff that every minute counts and represents myocardial tissue that is lost and not recovered.

Viera *et al*[23] report in their study that the average time from the first symptoms to the medical care provided was 6.4 hours, with a median of 3 hours; while the average time from the onset of symptoms and admission was obtained in 3 161 patients (89%), and was 4 hours in both periods (interquartile range 3 to 8 hours).

Balmori *et al*[27] showed that 14 patients arrived at the emergency department in the first 3 hours, 24.1%; and in the first 6 hours, 43 patients were received (74.1%), a situation favoring a better treatment to rescue myocardial damage. Cases with more than 6 hours, 15 patients (25.9%), did not receive the benefit of thrombolysis in the early hours, which are the most important ones to apply the thrombolytic treatment and achieve greater effectiveness.

The authors agree with the well-established criterion that the mere fact of shortening the time between the onset of symptoms and the first medical care is a factor that increases the chances of therapy success.

A study conducted in Venezuela[15] also showed a delay in the use of thrombolytic therapy in 56% of cases.

Leyva and Rego[21] argue that the most frequent reason for excluding patients from thrombolytic therapy is age and the delay in arriving at the hospital.

The main reason why thrombolysis was not performed in patients with STEMI was a prolonged time between the onset of symptoms and diagnosis. Others authors have argued that the non-use of thrombolytic therapy is caused mainly by: late diagnosis of AMI, without electrocardiographic criteria, non-Q-wave AMI and due to contraindications for thrombolysis[28-29].

In a study conducted in the province of Matanzas[5], the motives for not using thrombolysis were: time elapsed greater than 6 hours, clinical contraindication and non-ST segment elevation electrocardiogram.

The authors believe that it is necessary to conduct studies to evaluate the implementation of the current National Program of ischemic heart disease, with a vision of comprehensiveness; and to assess also the interdisciplinary principle of and cross-sectoral principle.

The importance of thrombolysis as a form of coronary reperfusion has been demonstrated, and how it contributes to a better prognosis in patients with AMI, which has been corroborated in other studies[29]. Rodríguez *et al*[15] found a 16.9% mortality rate for acute coronary syndromes with ST segment elevation, and it was shown that in this type of AMI non-reperfused patients had a higher mortality compared to reperfused patients both in hospitals and at one year after discharge.

Oliva Villa study[6], conducted at the Military Hospital of Matanzas, also shows a lower number of deaths in patients who received thrombolytic treatment (30 %), compared to those who did not receive it (68%).

Achiong *et al*[5] highlight the importance of a timely thrombolysis.

CONCLUSIONS

In the study, there was a predominance of males, the age group from 65 to 74 years, and hypertension as the main risk factor. Most of the patients received thrombolytic therapy, and arrived at the hospital 3 to 6 hours after of onset of symptoms. The predominant door-to-needle time was from 30 to 60 minutes. The relief of pain and the depression of the ST segment were the main criteria for reperfusion. The most common complication during thrombolysis was hypotension. The most common cause for not performing the procedure was an evolution of more than 12 hours; in this group deaths predominated. It is considered that timely thrombolysis remains the main tool to increase the survival rate and improve the quality of life in patients with AMI.

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