BRIEF REPORT

Cardiac Arrest within the First 24 Hours after Hospital Admission in ST-segment Elevation Acute Coronary Syndromes. The ARGEN-IAM-ST Registry

Paro cardíaco durante las primeras 24 horas del ingreso hospitalario en los síndromes coronarios agudos con elevación del ST. Registro ARGEN-IAM-ST

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ABSTRACT

Background: Cardiac arrest (CA) in the setting of an acute coronary syndrome is an important cause of in-hospital and out-of hospital mortality.
Objectives: The aim of this study was to describe the prevalence, clinical characteristics, and in-hospital outcome of patients from the ARGEN-IAM-ST registry with CA within the first 24 hours after hospital admission.
Results: The prevalence of CA within the first 24 hours was 7.8% (136/1,754 patients). These patients were older (median age 63 vs. 61 years, p <0.001) and had higher prevalence of cardiogenic shock (42.6% vs., 3%, p<0.01) and of in-hospital mortality (66% vs. 4%, p <0.001). Overall mortality of the registry was 8.8% (154/1754) and 58% occurred in patients with CA within the first 24 hours after admission.
Conclusions: Cardiac arrest within 24 hours in patients with ST- segment elevation acute coronary syndrome is a serious event representing 60% of in-hospital mortality.

Key words: Heart Arrest – Myocardial Infarction – Prognosis –Registries

RESUMEN

Introducción: El paro cardiorrespiratorio (PCR) en el contexto de un síndrome coronario agudo es una causa importante de muerte, tanto extra como intrahospitalaria.
Objetivo: El objetivo de nuestro trabajo fuedescribir la prevalencia, las características y la evolución intrahospitalaria de los pacientes que presentaron PCR durante las primeras 24 horas del ingreso (PCR24h) en la población del registro ARGEN-IAM-ST.
Resultados: la prevalencia de PCR 24 horas fue del 7,8% (136/1754 pacientes). Los que presentaron PCR24h eran más añosos (mediana: 63 vs 61 años, p<0,001), tuvieron más prevalencia de shock cardiogénico (42,6% vs 3%, p<0,01) y mortalidad intrahospitalaria (66% vs 4%, p<0,001). La mortalidad global del registro fue de 8,8% (154 muertes/1754 pacientes). Del total de las muertes intrahospitalarias (n: 154), el 58% ocurrió en los pacientes que presentaron PCR24h.
Conclusiones: El PCR24h en pacientes con un síndrome coronario agudo con elevación del ST es un evento grave y representa el 60% de las muertes intrahospitalarias.

Palabras clave: Paro cardíaco – Infarto del miocardio – Pronóstico – Registros

Abbreviations

PEA	Pulseless electrical activity	**VT/VF**	Ventricular tachycardia/ventricular fibrillation
CA	Cardiac arrest	**AMI**	Acute myocardial infarction
CS	Cardiogenic shock		

INTRODUCTION

Cardiac arrest (CA), as the first manifestation of an acute myocardial infarction (AMI), accounts for 50% of pre-hospital deaths; however, some patients receive medical care and are alive at hospital arrival or suffer in-hospital CA.

Objectives: The aim of this study was to describe the prevalence, clinical characteristics, treatment

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and in-hospital outcome of patients with CA within the first 24 hours after hospital admission due to ST-segment elevation AMI (STEMI)

METHODS

We analyzed the prevalence of CA within the first 24 hours after hospital admission to the 247 centers that participated in the ARGEN-IAM-ST registry between March 2014 and February 2016. Cardiac arrest was defined as the sudden cessation of cardiac activity that can lead to death if corrective measures are not taken rapidly or are not successful.

Univariate and multivariate analyses were performed to identify independent predictors of CA and mortality in this group of patients.

Ethical considerations

The protocol design of the ARGEN-IAM-ST registry was evaluated and approved by the Bioethics Committee of the Argentine Society of Cardiology, and was subjected to evaluation of the participating centers' committees, depending on local regulations and institutional policies.

RESULTS

Among the 1,754 patients included in ARGEN-IAM-ST registry, 136 (7.8%) presented CA within the first 24 hours after hospital admission. Overall mortality was 154/1,754 (8.8%), and 90 of these patients (58%) presented CA within the first 24 hours after hospital admission. These patients were older (median age 63 vs. 61 years, p <0.001), had similar risk factors and comorbidities but more patients had history of previous AMI (15% vs. 8%, p <0.01) (Table 1).

There were no differences in the rate of anterior AMI (37.5 vs. 44.3%), use of primary percutaneous coronary intervention (66 vs. 65%, p=0.4) or door-to-balloon time (95±35 vs. 95±40 minutes, p=0.4) between both groups. The prevalence of cardiogenic shock (CS) on admission was 42.6% in patients with CA vs. 3% in those without CA (p <0.01) and in-hospital mortality after CA was 66% vs. 4% (p <0.001). Mortality in patients with CA and CS was 84.5% (49/58) vs. 51% (33/78) in patients with CA in the absence of CS (p <0.001).

Heart rhythm during CA was obtained in 97% of the patients: 60% had ventricular tachycardia/ventricular fibrillation (VT/VF), 18% had asystole and pulseless electrical activity (PEA) was seen in 18%. Mortality in patients with VT/VF was 50% and increased to 95% in those with non-shockable rhythms (p < 0.001).

Age, diabetes, Killip class D and non-shockable rhythms were identified as independent predictors of mortality in CA patients (Table 2).

DISCUSSION

Cardiac arrest is the most fearsome and serious event in patients presenting with ST-segment elevation acute coronary syndrome in the pre-hospital phase. The most common underlying cause is the development of ischemia-induced VT/VF, which accounts for 50% of pre-hospital mortality. This circumstance implies the need for emergency services to be equipped with defibrillators (1, 2) and for the development of community-based cardiopulmonary resuscitation training programs and availability of automated external defibrillator devices in highly crowded locations.

Some STEMI patients arrive at hospital after being resuscitated from a CA or develop CA within the first hours after hospital admission. The prevalence of these cases varies between 7% and 10%. (3, 4) Our study specifically analyzes the characteristics of STEMI patients with CA within the first 24 hours after hospital admission (hereinafter "CA patients").

The prevalence of CS is remarkable, 43% vs. 3%. Cardiogenic shock in the setting of CA may be due to infarct size, history of prior AMI or myocardial dys-

Table 1. Patients' characteristics at presentation

Characteristics	CA within 24 h N = 136 (%) (7.75%)	Without CA N = 1,618 (%) (92.25%)	p
Age median (IQR)	63 (57-74)	61 (53-68)	<0.001
Men	109 (80)	1252 (77)	0.28
Dyslipidemia	43 (31.6)	622 (38.4)	0.23
Hypertension	86 (63)	922 (57)	0.2
Smoking habit	52 (38)	724 (45)	0.07
Diabetes	29 (21)	308 (19)	0.11
Previous AMI	18 (13)	148 (9)	0.09
Anterior AMI	51 (37.5)	718 (44.3)	0.1
Killip class D	58 (42.6)	48 (3)	<0.001
Absence of reperfusion therapy	23 (17)	259 (16)	0.42
Primary percutaneous coronary intervention	90 (66.2)	1050 (65)	0.42
Thrombolytic therapy	23 (17)	294 (18)	0.40
Door-to-balloon-time	95 (60-140)	95 (60-165)	0.65
Door-to-needle time	54 (31-75)	50 (30-90)	0.83

CA: Cardiac arrest; IQR: Interquartile range. AMI: Acute myocardial infarction.

Table 2. Multivariate logistic regression analysis of mortality

Characteristics	Odds ratio	95% CI	p
Age	1.1034	1.0473-1.1765	0.0027
Previous AMI	3.7898	0.3192-44.996	0.2981
Diabetes	6.9743	1.5434-31.514	0.0116
Killip class D	10.555	2.5779-43.2207	0.0011
Without reperfusion therapy	1.0834	0.1145-14.526	0.9518
Non-shockable rhythm	12.008	2.627-54.883	0.001

AMI: Acute myocardial infarction.

function induced by the excessive release of proinflammatory cytokines and cathecolamines during CA. The latter possibility is supported by the fact that CS also develops in almost two thirds of patients resuscitated from CA due to any cause, and not only after AMI. (5)

In our study, although 83% of the patients underwent reperfusion therapy, particularly percutaneous coronary intervention following guideline recommendations, (6) in-hospital mortality was very high (58%). Cardiac arrest within the first 24 hours after hospital admission is a predictor of in-hospital mortality almost as important as the presence of CS, as also expressed in the GRACE score. (7) The association between CA and CS increases mortality.

In our study, heart rhythm during CA was recorded in 97% of cases; 60% corresponded to shockable rhythms and were associated with lower mortality. This reinforces the importance of permanent electrocardiographic monitoring of patients as it has a direct prognostic implication. (8) The presence of VF/VT and early defibrillation is also associated with better survival in out-of-hospital CA. (9)

In our study, mortality rate in CA patients was 58%, while in other studies mortality ranged between 40 and 60%. (10, 11)

Patients who have presented CA during the first 24 hours and have survived the hospital phase still present a higher risk of mortality at 30 and 90 days, (12) but cardiac arrest itself does not have any residual impact on one-year mortality. (13)

Study limitations

These data have been obtained from the ARGEN-IAM-ST registry and only represent the results of the patients hospitalized in centers related to SAC/FAC scientific societies.

CONCLUSIONS

Cardiac arrest occurring within 24 hours after admission to the coronary care unit in patients with ST-segment elevation acute coronary syndromes is a serious event, representing 60% of in-hospital mortality. Older age, CS and the presence non-shockable rhythms were predictors of mortality after CA.

Conflicts of interest

None declared. (See authors' conflicts of interest forms on the website/Supplementary material).

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