

# Treatment Strategies in ST-segment Elevation Acute Coronary Syndrome in Tierra del Fuego, Argentina. TDF STEACS Registry

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## ABSTRACT

### Introduction and objectives

Due to the particular geographical and population characteristics of Tierra del Fuego province, an ST-segment elevation acute coronary syndrome (STEACS) registry assessing epidemiological, clinical, diagnostic and therapeutic aspects was conducted in patients admitted with this condition to establish optimal treatment strategies.

### Methods

This study was a prospective registry in 47 consecutive patients admitted with less than 12-hour STEACS evolution in the four middle and high complexity centers of the province from the beginning of November 2009 to the end of October 2010.

### Results

Mean age was  $55 \pm 10.1$  years, and 89.4% were men. The annual prevalence of cases was 3.72/10000 inhabitants. Seventeen percent of patients had history of myocardial infarction and 19.2% had undergone coronary angioplasty or myocardial revascularization surgery. Reperfusion therapy was performed in 85.1% of patients: 57.4% with fibrinolytic agents and 27.7% with primary angioplasty. Median pain to door time was 145 minutes (interquartile range 60-240) and door to reperfusion time was 42.5 minutes (25-240). Mortality was 8.5% and heart failure was present in 19.1% of patients.

### Conclusions

A high percentage of patients underwent reperfusion therapy. Delays to treatment occurred in the pre-hospital stage.

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**Key words >** Myocardial infarction - Epidemiology - Mortality - Registry

**Abbreviations >**

<b>rt-PA</b>	Recombinant tissue plasminogen activator	<b>STEACS</b>	ST-segment elevation acute coronary syndrome
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## INTRODUCTION

ST-segment elevation acute coronary syndrome (STEACS) is a challenge for the health care system which must try to have access to a reperfusion therapy as quickly as possible in order to reestablish coronary flow and reduce morbidity and mortality. (1) Tierra del Fuego is the most Southern province of Argentina with special characteristics, as it consists mainly of a young immigrant population with a lifestyle greatly influenced by low temperatures throughout the year favoring sedentarism and a high calorie diet. (2, 3)

The aim of this study was to establish in this context, the epidemiological, clinical, diagnostic and therapeutic aspects of STEACS at the time of admission in the only four intensive care centers of the province, equivalent to the total number of patients admitted with this condition during a one-year period.

## METHODS

All centers with intensive care units in Tierra del Fuego admitting STEACS patients were invited to participate in a prospective registry of consecutive patients, collecting data

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from previous history and in-hospital outcome.

Patients presenting prolonged chest pain (> 20 minutes duration) within 12 hours from onset of symptoms, ST-segment elevation  $\geq 1$  mV in two contiguous limb leads or  $\geq 2$  mV in two or more contiguous precordial leads or presumably new complete left bundle branch block entered the study.

Demographic data, and history of risk factors or cardiovascular disease were recorded and STEACS location, Killip and Kimball class on admission, onset of symptoms to door and door to reperfusion times were obtained, together with initial reperfusion strategies and in case this was not performed, the reason why it was not received. (4) The time to reperfusion was determined in patients receiving fibrinolytics and initially invasive strategy. In-hospital complications and mortality were recorded. Positive reperfusion clinical syndrome was considered if 90 minutes after full fibrinolytic dose ST-segment elevation was reduced by > 50% in the lead presenting the greatest elevation. (5) Angioplasty was considered successful according to the interventional cardiologist's criterion.

#### Other definitions

Dyslipidemia: prior cholesterol > 200 mg/dL or triglycerides > 150 mg/dL referred by the patient or recorded in the clinical history or previous treatment with hypolipidemic drugs or diet.

Hypertension: prior arterial pressure values  $\geq 140/90$  mm Hg referred by the patient or previous treatment.

Obesity: body mass index  $\geq 30$ .

Smoking: Smoking habit at the time of admission

Diabetes: prior fasting blood sugar  $\geq 126$  mg/dL referred by the patient or previous treatment with drugs or diet.

#### Statistical analysis

Collected data was incorporated into a database and analyzed using EpiInfo 2000 statistical package.

Qualitative variables were expressed as frequencies and percentages and quantitative variables as mean  $\pm$  standard deviation or median with interquartile intervals according to Gaussian or non-Gaussian distribution.

#### RESULTS

A total of 47 consecutive patients were admitted with STEACS in the only four intensive care unit centers of the province from the beginning of November 2009 to the end of October 2010. Among these patients, 27 were initially hospitalized in Río Grande (25 at the Hospital Regional and 2 at CEMEP) and 20 in Ushuaia (12 at the Hospital Regional and 8 at Sanatorio San Jorge). Mean age was  $55 \pm 10.1$  years, and most patients were men (89.4%). Average in-hospital stay was 4.7 days (range 1 to 22) and 15 patients (31.9%) required transfer from lower complexity to higher complexity centers with hemodynamic facilities, all within the province. Table 1 details baseline population characteristics.

Time from onset of symptoms to door was 145 minutes (interquartile range 60-240, mean 204.9), and time from door to reperfusion was 42.5 minutes (interquartile range 25-540, mean 80.6). Initial reperfusion strategy was pharmacological in 27 patients (57.4%), primary angioplasty in 13 (27.7%) and no therapy in 7 (14.9%). Reasons for not performing reper-

fusion were sub-diagnosis in 5 cases and spontaneous return of ST segment to normality in 2. Streptokinase was the fibrinolytic of preference (20 patients, 74%) and rt-PA was less used (7 patients, 26%). A positive reperfusion clinical syndrome was achieved in 17 patients (63%). Among the 10 patients not presenting a positive outcome, rescue angioplasty was decided in 6 patients, differed angioplasty in 2 and no posterior treatment in the rest. Among the 13 patients considered for initial invasive strategy, 12 patients received primary angioplasty, 9 of which were considered successful (75%) and medical treatment was preferred in one case. Median door to needle time was 40.5 minutes (20-60, mean 41.0), whereas door to balloon time was 95 minutes (interquartile range 60-240, mean 163.8). More than half of the patients (7 out of 13) receiving primary angioplasty experienced > 90 minute delay to access to this reperfusion strategy.

In-hospital mortality was 8.5% (4 patients) and 19.1% (9 patients) presented heart failure during hospitalization. Table 2 shows other complications. Fourteen point nine percent of patients required mechanical respiratory assistance, 6.4% Swan-Ganz catheter placement and 4.3% transient pacemaker. Regarding

**Table 1.** Baseline population characteristics

n	47
Age, years (mean $\pm$ SD)	55 ( $\pm$ 10.1)
Men, n (%)	42 (89.4)
Coronary risk factors	
Hypertension, n (%)	28 (59.6)
Smoking, n (%)	29 (61.7)
Dyslipidemia, n (%)	35 (74.5)
Diabetes, n (%)	10 (21.3)
Obesity, n (%)	13 (27.7)
Cardiovascular history	
Previous myocardial infarction, n (%)	8 (17.0)
Previous angina, n (%)	8 (17.0)
Coronary angioplasty, n (%)	7 (14.9)
Coronary bypass surgery, n (%)	2 (4.3)
Peripheral artery disease, n (%)	5 (10.6)
Stroke, n (%)	4 (8.5)
ECG anterior wall involvement, n (%)	26 (55.3)
Killip class on admission	
A, n (%)	41 (87.1)
B, n (%)	2 (4.3)
C, n (%)	2 (4.3)
D, n (%)	2 (4.3)
Mean heart rate on admission, beats/min	78.3
Mean systolic pressure on admission, mm Hg	127.6

SD: Standard deviation. ECG: Electrocardiogram. n: Number of patients.

adjuvant treatment, there was high use of aspirin, clopidogrel, statins and beta-blockers (Table 3).

## DISCUSSION

This study provided the opportunity of identifying epidemiological, clinical and therapeutic STEACS data in Tierra del Fuego due to the low number of provincial centers admitting patients with this syndrome. The only four centers acting in this emergency during the time of data acquisition participated in the study. The geographical context is defined by two cities (Río Grande with more than 70000 inhabitants and Ushuaia with approximately 57000), separated by more than 200 km and a mountain range, preventing an easy communication during part of the year. (6) In Río Grande there is a higher complexity center (Hospital Regional) where the hemodynamics unit works only one or two days a week and another lower complexity center with scarce admission of critical patients. Ushuaia has a center with permanent hemodynamic service (Clínica San Jorge) and the Hospital Regional, which receives most STEACS patients and decides their transfer to the private center for initial invasive

**Table 2.** In-hospital mortality and complications of patients included in the TDF STEACS registry

Complication	n (%)
Death	4 (8.5)
In-hospital heart failure	9 (19.1)
Angina (postinfarction or reinfarction)	5 (10.6)
Bradycardia	5 (10.6)
Ventricular tachycardia	2 (4.3)

n: Number of patients.

**Table 3.** Pharmacological treatment and devices used during hospitalization

Treatment	n (%)
Aspirin	47 (100)
Clopidogrel	47 (100)
Statins	42 (89.4)
Beta-blockers	35 (74.5)
ACE inhibitors	24 (51.1)
Loop diuretics	5 (10.6)
Aldosterone antagonists	3 (6.4)
Inotropic drugs	11 (23.5)
IIB-IIIa antagonists	2 (4.3)
MRA	7 (14.9)
Swan-Ganz catheter	3 (6.4)
Transient pacemaker	2 (4.3)
MCA o IABP	0

MCA: Mechanical circulatory assistance. MRA: Mechanical respiratory assistance. IABP: Intra-aortic balloon pump. ACE: Angiotensin-converting enzyme. n: Number of patients.

treatment according to medical criteria. Our work shows an annual rate of 3.72/10000 inhabitants admitted with STEACS within the first 12 hours from onset of symptoms, lower than the one presented by Caccavos et al.'s retrospective study in the city of Coronel Suárez (9.06/10000 inhabitants). (7) This difference could be ascribed to the type of population pyramid observed in our province, consisting mainly of young persons with a lower number of older people more susceptible to cardiovascular events, and another difference could be attributed to the inclusion of patients within 24 hours from onset of symptoms in the Buenos Aires province study. (6) In our province, mortality (8.5%) did not differ greatly from other surveys: the last myocardial infarction registry of the Argentine Society of Cardiology revealed 12.5% mortality in reperfusion-eligible patients (8) and 7.0% in the international 2001 GRACE study. (9) The United States National Registry of Myocardial Infarction (NRFMI) presented a mortality rate that was modified from 11.5% in 1994 to 8.0% in 2006 (10) and the Euro Heart Survey ACS III performed in 138 European centers showed a mortality rate varying from 8.1% in 2006 to 6.6% in 2008. (11) The prevalence of patients receiving reperfusion therapy is greater than that of other surveys: in the 2005 Argentine registry, 19.7% of eligible patients for reperfusion did not receive it. (8) In international evaluations, percentages vary between 30% in the GRACE study, (12) 24% in the NRFMI 2 (13) and in more recent studies as the ACSIII in Europe and the CRUSADE study in the United States it reached 18.7% (11) and 17.5%, (14) respectively, while in our experience it was only 14.9%. Time to reperfusion was rather prolonged (mainly at the expense of the pre-hospital stage) taking into account the fast access to the health care system existing in the two cities of the province. The difference in the time of door to needle or door to balloon raises the question of protocol management, as the delay in invasive intervention seems unacceptable. (15, 16) Pharmacological treatment during hospitalization involves a high percentage of drugs recommended for this type of condition. It should be pointed out that the high use of inotropic drugs might correspond to their utilization as vasopressors and we consider that there may be under-recorded use of loop diuretics, which is not in agreement with the number of patients presenting in-hospital heart failure.

## CONCLUSIONS

We conclude that in our province there is a low prevalence of STEACS and that a high percentage of patients receive some kind of reperfusion therapy. However, there is delay in its delivery, at the expense of the pre-hospital stage and also in the door to balloon time compared with the door to needle time. These findings commit both the public and private health care systems to find the best strategy for an optimal treatment of STEACS in our province.

**RESUMEN****Estrategias de tratamiento en el síndrome coronario agudo con elevación del segmento ST en la provincia de Tierra del Fuego, República Argentina. Registro SCACEST TDF****Introducción y objetivos**

Dadas las características propias, geográficas y poblacionales, de la provincia de Tierra del Fuego, se desarrolló un registro de pacientes ingresados por síndrome coronario agudo con elevación del segmento ST (SCACEST) con el propósito de conocer los aspectos epidemiológicos, clínicos, diagnósticos y terapéuticos de los pacientes internados con este cuadro que permitan el establecimiento de estrategias para un tratamiento óptimo.

**Material y métodos**

Registro prospectivo y consecutivo de 47 pacientes ingresados, desde principios de noviembre de 2009 a fines de octubre de 2010, con SCACEST de menos de 12 horas de evolución en los cuatro únicos centros de mediana y alta complejidad de la provincia.

**Resultados**

La media de edad de los 47 pacientes fue de  $55 \pm 10,1$  años, el 89,4% eran hombres. La incidencia anual fue de 3,72/10.000 habitantes. El 17% tenía infarto previo y el 19,2%, angioplastia coronaria o cirugía de revascularización miocárdica. El 85,1% recibió terapia de reperfusión: fibrinolíticos el 57,4% y angioplastia primaria el 27,7%. El tiempo dolor-puerta tuvo una mediana de 145 minutos (intervalo intercuartil de 60-240) y el de puerta-reperfusión fue de 42,5 minutos (25-540). La mortalidad ascendió al 8,5% y presentó insuficiencia cardíaca el 19,1%.

**Conclusiones**

Un porcentaje alto de pacientes recibió reperfusión. Existió retraso a expensas de la etapa prehospitalaria.

**Palabras clave** > Infarto de miocardio – Epidemiología – Mortalidad - Registro

**Conflicts of interest**

None declared.

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