ORIGINAL ARTICLE

Effectiveness of the use of semiautomatic defibrillation in basic life support services

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None

Objective: The objective of this study was to determine the importance of the use of semiautomatic defibrillation for the treatment of out-of-hospital cardiorespiratory arrest of any etiology attended initially by basic life support ambulante services. The analysis was based on survival and neurological evaluation 7 days after the event.
Design: A prospective, descriptive, transverse, longitudinal study that analyzed survival and the neurological status using the Glasgow-Pittsburgh scale 7 days after cardiorespiratory arrest in 233 patients attended over a 5-year period by a twotier, urban, out-of-hospital emergency service based in Madrid, Spain (SAMUR-PC).
Results: Survival with complete recovery observed after out-of-hospital cardiorespiratory arrest was 7.29%, a figure very similar to the results for recovery in our department (12%), which included the arrests attended directly by advanced life support services. There was a significant difference between the patients given early defibrillation by the basic life support team and those in whom this was not performed based on the initial rhythm. It was also found that the initial call for assistance specified cardiorespiratory arrest or unconsciousness in only 37.7% of cases.
Conclusions: The primary response to cardiorespiratory arrest by basic life support ambulance services with semiautomatic external defibrillators can achieve survivals similar to those in patients attended directly by advanced life support services. [Emergencias 2009;21:12-16]

Key words: Basic life support. Semiautomatic defibrillation. Emergency techniques. Cardiorespiratory arrest. Survival.

Introduction

EThe management of cardiopulmonary arrest (CPA) occurring in public may constitute one of the main challenges faced by an Out-of-hospital Medical Emergency Service. Rapid processing of the call, correct assignment of resources, a short response time, adequate staff training in resuscitation techniques and evidenced-based procedures are some of the keys to the successful management of this pathology[1-11]. The relation between survival of these patients and response time is widely established[12,13]. The search for new, useful and effective instruments and intervention methods should be permanent, since they may prove vital when faced with a case of CPA[14]. For public access defibrillation[16], it is necessary to ensure correct area distribution of out-of-hospital attendance units in order to achieve early arrival at the scene of the event[9]. This is clearly not possible using only medicalised resources [Advanced Life Support (ALS) Units]. In a two-tier Out-of-hospital Emergency Service such as SAMUR Protección Civil (SAMUR-PC), whose most numerous resources are Basic Life Support (BLS) units staffed by two emergency technicians and equipped for defibrillation, with a second tier of ALS units, staffed by a physician, qualified nurse and emergency technician, it is necessary to discriminate exactly what type of resource should be sent out. To suppose that the first response to a CPA should "always and only" be an ALS unit is today a clearly inefficient measure in health-care management[17-19]. Professional training of emergency technicians, together with adequately equipping BLS units, are important to shorten the time taken to provide initial care of the [3-6,20-24].

In 1995, SAMUR-PC incorporated the first semiautomatic defibrillators (AED) into the service[25] and today all BLS units carry this device. The main objective of this study was to evaluate the effectiveness of AED implementation in the BLS units of

an Out-of-hospital Medical Emergency Service. We wished to determine survival data of those patients initially defibrillated by these units versus those who were not, or those initially defibrillated by ALS units.

Method

A prospective, descriptive, longitudinal, cross-sectional study was designed. The study setting was the out-of-hospital medical emergency service of the Madrid City Council (SAMUR-PC). This service is organized as a two-tier system, with BLS units equipped with AED and ALS units. It is activated by calls to the single European emergency number (112) and the criteria of response to demands were established as a function of severity and the time taken to reach the patient. SAMUR-PC has a rigorous quality control system that includes, among other measures, follow-up of all critical patients at 6 hours, 24 hours and 7 days after admission to hospital.

The study population included all those patients who suffered an out-of-hospital CPA and were first attended by a BLS unit equipped with a AED during a 5-year period from February 2001 to February 2006. Variables studied were: age, sex, cause of initial activation, response time (from the end of the call requiring attendance to the moment of attendance), survival at 6 hours, 24 hours and at 7 days, and cerebral function evaluation using the Glasgow-Pittsburg Scale at 7 days after admission. Statistical analysis of data stored on Access 2000 was performed using SPSS v.13.0. Qualitative variables are described as frequencies and quantitative variables as central means and dispersion. Qualitative variables were compared using chi square test and means were compared using Student t test and non-parametric tests (Mann-Whitney U) for non-normal distributions. A p value of < 0.05 was considered statistically significant. Ethical aspects were respected and data confidentiality guaranteed.

Results

The criteria for inclusion were met by 233 patients (Figure 1). Mean age was 63 ± 18 years. The proportion of men was clearly higher than that of women (77% vs 23%). Mean response time was 7 minutes 54 seconds, with a significant difference ($p < 0.05$) between cases of death (8 mins. 12 secs) and 7-day survivors (5 mins. 53 secs). Reasons for activating BLS units are shown in Figure 2. Confirmed CPA represented only 6% of the cases and "unconscious patient" was the reason in 31%. In the remaining 63% of cases, the data given by the caller (alerter) did not allow presumption of CPA. In only 14.8% of 7-day survivors, the reason for the alert was suspected CPA (Figure 3).

Of all CPA patients attended by BLS units, 54.5% were defibrillated by BLS technicians. In total, reversion of the CPA haemodynamic situation was achieved in 106 cases (45.5%). In all cases, definitive transfer to hospital was performed by ALS units after first being attended by BLS units. Of these, 53.3% were alive at 6 hours after admission to hospital, 46.7% at 24 hours, and at 7 days, 27 (25% of all admissions and 11.6% of all the 233 CPA attended by BLS units).

Of the 27 7-day survivors of CPA in a public space, 17 showed perfect neurological state (grade 1 of the Glasgow-Pittsburg Scale) with complete recovery or were attended for other associated pathologies. This number of patients constituted 7.29% of the 233 CPA cases first attended by BLS units. Survival of these cases was significantly higher than that of CPA patients who only received cardiopulmonary resuscitation (CPR) without defibrillation (75% versus 25%, $p < 0.001$).

Discussion

The first conclusion relates to the initial hypothesis of the study: to demonstrate the effectiveness of implementing AED in all BLS units; previously demonstrated in diverse studies[6,14,15,20-25,30] and confirmed in this, given the number of CPA

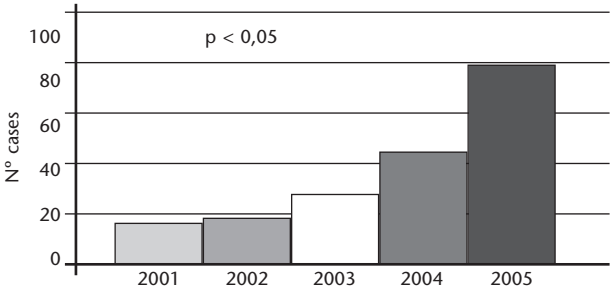

Figure 1. Annual distribution of the 233 cases of cardiopulmonary arrest attended by Basic Life Sport units in this 5-year study.

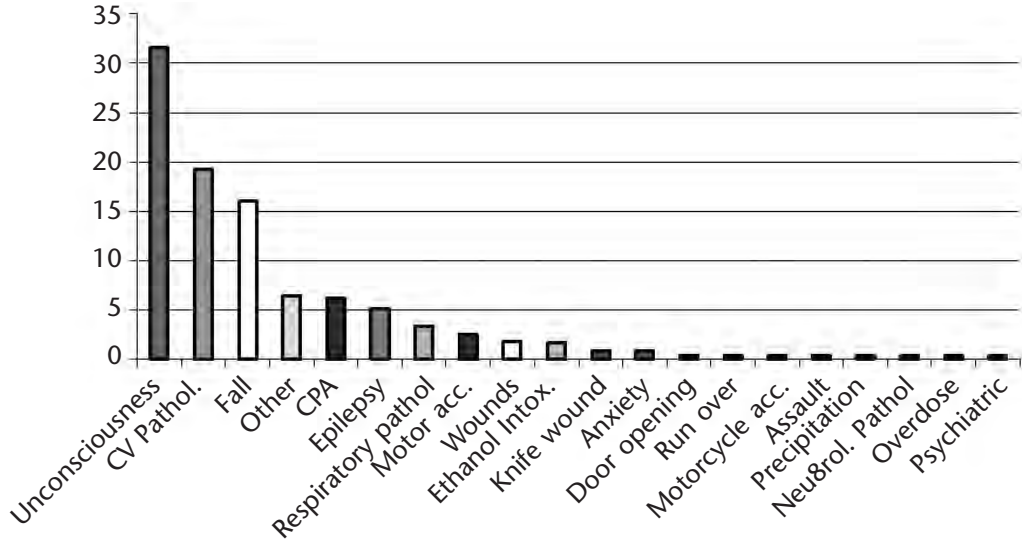

Figure 2. Data on reasons for activation. CV: cardiovascular. Pathol: pathology. CPA: cardiopulmonary arrest. Acc: accident. Intox: intoxication.

recoveries and survivors, as well as neurological state scores[25] since 17 of 27 (62.9%) 7-day survivors showed perfect neurological state. There is another even more relevant statistic supporting the implementation of AED in BLS units, which is the fact that the initial alert information did not predict the real pathology in the great majority of cases (94%), which was the main reason for sending out BLS units in the first place. This reveals the great utility of their being equipped with these devices at all times.

There is currently important lack of knowledge in the general population about recognising a CPA situation, which is essential as the first link in the Survival Chain[26]. Thus the necessity for public information campaigns such as the Alert Program implemented by SAMUR-PC since 10 years ago, which trains an average of 10,000 citizens in recognition of emergency situations, the early alert system and initiation of the first measures for resuscitation[35]. In the same line, recent studies such as that by Caffrey et al[27] highlight the efficacy and benefit in terms of survival of Public Access Defibrillation programs such as that developed in Madrid with collaboration between SAMUR-PC and the company Telefónica, with more than 100 AED installed in towers called "rescate cardiaco" (cardiac rescue) situated in busy areas of the city[35].

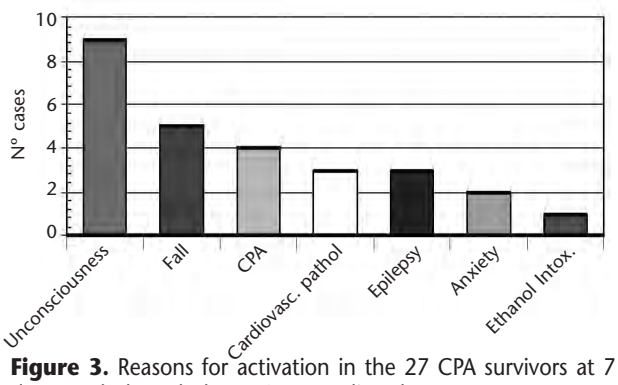

Figure 3. Reasons for activation in the 27 CPA survivors at 7 days. Pathol: pathology. CPA: cardiopulmonary arrest. Intox: intoxication.

Of course, response time is a crucial factor when comparing results. De Maio et al[12] affirm that the objective of 8 minutes should be reduced to 7 minutes, which provides a further argument in favour of equipping BLS units with AED. In any emergency system, BLS units constitute the greatest percentage of ambulances, and therefore a higher number of adequately distributed AED, with greater potential proximity to CPA events and early defibrillation. Other recent studies confirm the benefit of initial use of defibrillators in terms of survival. Bunch et al[28] affirm that the survival of CPA patients after out-of-hospital FV increased by 12% following the implementation of an early defibrillation program. In studies by Hallstron et al[16] and Uriarte et al[31] published in August 2004 in the New England Journal of Medicine, 30 of 130 CPA patients initially treated with AED survived, while in the group of patients only receiving initial CPR 15 of 107 CPA patients survived ($p = 0.03$; RR = 2.0).

Finally, the percentage of BLS-attended survivors without neurological deficit was 7.29%, just below that for non-presential CPA (cases occurring in the presence of health-care professionals were ruled out, which had the greatest percentage of survival) attended by SAMUR-PC and oscillating

around 12%. Similar studies have reported admission survival rates of 2.72% (study by Uriarte et al[31], published in EMERGENCIAS 2001) and global survival of 4.1%

in a study by Lim et al[32] published in Resuscitation (without clarifying whether cases of presential CPA were also included). In the SAMUR-PC service, this figure is used as an indicator of management, and is considered to objectively reflect the general running of the service[33].

With adequate and continuous training, Emergency Technicians are capable of providing excellent instrumental BLS care of CPA patients CPA[20-25], increasing the survival and neurological recovery rates of patients suffering CPA in an out-of-hospital setting. In our study we observed an increasing global number of cases with early defibrillation over the 5-year period, in accord with greater presence and competence of the BLS units in daily SAMUR-PC practice.

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Efectividad de la implementación de la desfibrilación semiautomática en la Unidades de Soporte Vital

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Objetivo: Evaluar la importancia de la aplicación de la desfibrilación semiautomática en el tratamiento de paradas cardiorrespiratorias (PCR) no presenciadas, de cualquier etiología, atendidas inicialmente por unidades de Soporte Vital Básico (SVB), mediante el análisis de la supervivencia y valoración neurológica a los 7 días del suceso.
Método: Estudio prospectivo, descriptivo transversal/longitudinal, que analiza la supervivencia y el estado neurológico mediante la Escala de Glasgow-Pittsburg a los 7 días de la PCR de 233 pacientes atendidos durante un periodo de 5 años por el servicio urbano de emergencias extrahospitalarias de doble escalón de Madrid (SAMUR-PC).
Resultados: La supervivencia "ad integrum" tras una PCR no presenciada fue de 7,29%, muy próxima a los resultados globales de recuperación en nuestro servicio (12%), en los que se incluyen las PCR atendidas inicialmente por unidades de Soporte Vital Avanzado (SVA). Se constata una diferencia significativa entre los pacientes desfibrilados precozmente por SVB y aquéllos que por su ritmo inicial no lo habían sido. La demanda inicial de asistencia sólo hizo prever una PCR en el 37,7% de todos los casos.
Conclusiones: La primera respuesta a la PCR de origen no traumático con unidades de SVB con desfibrilador semiautomático (DEA) puede alcanzar niveles de supervivencia similares a la asistencia inicial por SVA. [Emergencias 2009;21:12-16]

Palabras clave: Soporte Vital Básico. Desfibrilación semiautomática. Técnicos de Emergencia. Parada cardiorrespiratoria. Supervivencia.