Research Article

Retrospective evaluation of cases with cardiopulmonary resuscitation in the emergency department

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Abstract

In this study, the cases which underwent cardiopulmonary resuscitation (CPR) in the emergency department of our hospital were examined. We aimed to obtain the initial data on this subject and contribute to the literature by determining the demographic and clinical characteristics, neurological recovery, factors affecting prognosis and survival of the cases that underwent CPR. A total of 371 patients were included in this study (between 01.01.2017 and 31.12.2018). Patient data were obtained retrospectively from patient files in the hospital archives and through the hospital automation system. Patients that underwent CPR were grouped according to age, gender, location of arrest, arrest rhythm, duration and result of CPR. In our study, return of spontaneous circulation (ROSC) rate after CPR was 36.9% in hospital cardiac arrest (IHCA) cases and was 33.7% in out of-hospital cardiac arrest (OHCA) cases. In cases with ROSC, 0-24 hour survival rate was 59.7%, 1-30 day survival rate was 32.1%, 1-12 month survival rate was 8.2%. It was determined that 6 (5.7%) of the cases with ROSC in IHCAs and 4 (13.8%) of cases with ROSC in OHCAs were discharged. Neurological recovery according to cerebral performance category (CPC) scale in 10 patients discharged from the hospital was; CPC-1 in 7 patients, CPC-3 in 3 patients, while brain death (CPC-5) occurred in 6 patients with ROSC after CPR. The rate of ROSC after CPR is higher in IHCA cases. CPR is more successful in patients with coronary artery disease and hypertension as comorbid diseases, contrary to the lower success rate in patients with malignancy. Survival rate and neurological recovery are better in patients with cardiac-induced CPA.

Keywords: cardiac arrest, cardiopulmonary resuscitation, emergency department, spontaneous circulation

1. Introduction

Cardiopulmonary arrest (CPA) is a mortal condition that can be seen at any age group and is a public health problem across the world (1). The aim of CPR is to obtain the ROSC and for patients to return to their normal lives with a good neurologic recovery (2, 3). CPR has been used in clinical practice for more than 60 years and there have been many developments in CPR in recent years. Updated guidelines on CPR have been published however, there are no satisfactory studies particularly about discharge and survival rates following cardiac arrest so far (4). There is no study revealing the results of CPR applied in the emergency department of our hospital therefore, this study aims to contribute to the literature by determining following elements; the demographic and clinical features of the patients who underwent CPR in the emergency department of our hospital, the number and rate of successful CPR, the discharge rate, neurological recovery outcomes in patients attaining ROSC following CPR and factors affecting prognosis and survival.

2. Materials and Method

Retrospectively, it was detected that 416 CPA cases were seen in 2 years (2017-2018) in the emergency department of our hospital. The study was carried out with a total of 371 patients; excluding 45 patients which were under the age of 18, the patients that were considered deceased on arrival and the patients with insufficient data available. Patient data were obtained from the files in the hospital archives and through the hospital automation system. Patients who underwent CPR were grouped according to the features; age (18-65 years, over 65 years), gender, location of arrest (in-hospital, out-of-hospital), arrest rhythm (asystole, PEA, VF, pVT), duration of CPR (0-20 min, >20 min), and CPR result (ROSC or exitus). The distribution of the patients who underwent CPR according to months of the year and hours of the day, their comorbid diseases, causes of arrest, defibrillation and endotracheal intubation rates were examined. In the patients attaining ROSC following CPR; final status in the emergency department (hospitalization to intensive care or death), short and long-term survival rates, factors affecting survival, and neurological recovery results were analyzed. CPC scale was used to determine the neurological recovery outcome of the patients following CPR. The data were analyzed with IBM SPSS V23.

3. Results

In our study, 53.6% of the cases were males, and 46.4% were females. We detected IHCA rate to be 75.2% and the OHCA rate to be 24.8%. While the most common arrest rhythm was asystole (61.7%), the shockable rhythm (VF/pVT) rate was 10.8%. Demographical and some of the clinical features of the patients are indicated in Table 1.

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Table 1. Distribution of demographical and some of the clinical data in CPA cases

	n	%
Age groups		
18-65 years	144	38,8
over 65 years	227	61,2
Gender		
Male	199	53,6
Female	172	46,4
Arrest location		
Out-hospital	92	24,8
In-hospital	279	75,2
ED Red Zone	158	56,6
ED Intensive Care	121	43,4
Arrest rhythm		
VF	33	8,9
pVT	7	1,9
PEA	102	27,5
Asystole	229	61,7
Defibrillation		
Yes	53	14,3
No	318	85,7
Endotracheal Intubation		
Yes	356	96,0
No	15	4,0
CPR duration		
0- 20 min	118	31,8
>20 min	253	68,2

In this study, the rate of ROSC following CPR was 36.9% in IHCA cases, while it was 33.7% in OHCA cases. Cardiac-induced cardiopulmonary arrest rate was %35.6. The rate of ROSC following CPR was 39.4% in patients with cardiac CPA and 34.3% in CPA patients of non-cardiac origin. Among cardiac related CPA cases, rate of neurological recovery as CPC-1 at discharge was 85.7% while rate of CPC-1 at discharge was 11,1% in non-cardiac related CPA cases (p=0.007). CPR was more effective in patients with comorbidities such as CAD (p=0.015) and HT (p=0.022); while it was less effective in patients with malignancy (p=0.012). Rate of ROSC after CPR was found to be 96,6% in patients that received CPR for 0-20 minutes, while ROSC rate was 7.9% in patients that received CPR for more than 20 minutes (p<0.001). It was determined that the number of patients discharged following CPR application in both in-hospital and out-of-hospital CPA patients was higher in the patient group with a CPR duration of 0-20 minutes. Rate of ROSC after CPR according to the arrest rhythms were; 100% in pVT cases, 54,5% in VF cases, 52% in PEA cases, 24.5% in asystole cases (p<0.001). Rate of ROSC following CPR was 58.5% in defibrillated cases and was 32,4% in non-defibrilated cases (p<0.001). Discharge rate of OHCA's that had ROSC after CPR was 37.5% in defibrillated cases and was 4.8% in non-defibrillated cases (p=0.022). In cases with ROSC, survival rate was 59.7% in 0-24 hour, 32.1% in 1-30 day, 8.2% in 1-12 month. Among the patients who attained ROSC, 6 (5.7%) patients from the IHCA group and 4 (13.8%) patients from the OHCA group were discharged. Neurological recovery of 10 patients discharged from the hospital according to CPC were; CPC-1 in 7 patients and CPC-3 in 3 patients, while brain death (CPC-5) occurred in 6 patients who attained ROSC following CPR.

4. Discussion

In a study carried out by Pandian et al. sudden CPA cases of 254 patients seen in the emergency department of a tertiary hospital for a period of 1 year, were analyzed; they detected the rate of IHCA to be 73.6% and the rate of OHCA to be 26.4% (5). In our study, the annual CPA rate was 2.2 per thousand, the mean age was 68,8 years, the male gender ratio was 53.6%, the IHCA rate was 75.2%, and the OHCA rate was 24.8%; which were consistent with the literature.

In a study conducted with 727 patients, Ong et al. reported that the first recorded heart rhythm in the emergency room in CPA patients was 69.2% asystole, 19% PEA, 7% VF, and 1% pVT (6). Andersen et al. stated in a review regarding IHCA patients in USA that CPA was mostly due to cardiac reasons (50-60%) which was followed by respiratory failure (15-40%) (7). In our study, the results indicated arrest rhythm as 61.7% asystole, 27.5% PEA, 8.9% VF and 1.9% pVT which were similar to the literature data.

ROSC rates can vary considerably between different communities. For instance, while it is 43.8% in Germany, the Pan-Asian resuscitation outcomes study (PAROS) reports the ROSC rate as 8.3%. ROSC rates have been reported as 38% in Switzerland, 21% in Italy, and 50% in Finland (8). Zive et al. reported the rate of ROSC in the emergency department as 14.8%-47.8% in their study, in which they explored the survival of 85.553 OHCA cases that occurred in a 4- year period of time in 10 geographic regions in North America (9). In accordance with the literature, the rate of ROSC after CPR in our study was 37.6% in IHCA cases, 31.5% in OHCA cases. ROSC rates in IHCA cases were 17.4% in the emergency department intensive care unit and 51.9% in the emergency department red zone. Positive factors regarding survival and discharge were; cardiac related CPA and presence of cardiac comorbidity in the patient while negative factors were; malignancy, sepsis and organ failure (10). Xue et al. in their study analyzing the factors affecting outcomes after CPR in ER stated that positive factors regarding discharge and neurological recovery were cardiac related CPA, shockable initial arrest rhtyhm and CPR duration less than 15 minutes (4). In our study rate of neurological recovery as CPC-1 at discharge was 85.7% in cardiac related CPA cases while rate of CPC-1 at discharge was 11.1% in non-cardiac related CPA cases.

In a Swedish cohort study that investigated the relation between CPR duration and 30 day survival rate after ROSC in IHCA cases, Rohlin et al. found that longer CPR duration was related to worse 30 day survival rate (11). In our study, rate of ROSC after CPR was found to be 96.6% in patients that received CPR for 0-20 minutes, while ROSC rate was 7.9% in patients that received CPR for more than 20 minutes. It was noticed that the number of patients discharged after CPR in

IHCA and OHCA cases were higher in patients that received CPR for 0-20 minutes.

Hirlekar et al. in a study that evaluated survival rates and neurological outcomes in elderly IHCA patients, stated the positive prognostic factors that affected survival were; initial rhythm as VF/pVT, cardiac induced CPA and application of defibrillation while in patients with initial rhythm as asystole and PEA survival rates were lower (12). In our study, rate of ROSC after CPR according to the arrest rhythms were; 100% in pVT cases, 54.5% in VF cases, 52% in PEA cases, 24.5% in asystole cases. Rate of ROSC following CPR was 58.5% in defibrillated cases and was 32.4% in non-defibrilated cases. Discharge rate of OHCA's that had ROSC after CPR was 37.5% in defibrillated cases and was 4.8% in non-defibrillated cases. Our findings were consistent with the literature. Our study bears significance as it is the first study to research CPR cases undergone in the emergency department of our hospital. The constraints of the study are that it is a retrospective study, only 2 years time period was researched for the CPA cases, and some cases could not be included in the study due to lack of data. Improvements are required in the documentation of CPR interventions.

In conclusion, in this study, CPA is most commonly caused by cardiac causes. In IHCA cases, the rate of ROSC following CPR is higher. Survival rates and neurologic recovery outcomes are better in cardiac-induced CPA cases. CPR is more successful in patients with CAD disease and HT as comorbid diseases, contrary to the lower success rate in patients with malignancy. Shockable arrest rhythm, CPR duration of fewer than 20 minutes, and defibrillation in patients with OHCA increase survival.

Conflict of interest
The authors declared no conflict of interest.

Authors' contributions
Concept: B.D., L.D., Design: B.D., L.D., Data Collection or Processing: B.D., L.D., Analysis or Interpretation: B.D., L.D., Literature Search: B.D., L.D., Writing: B.D., L.D.

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