Effect of End-Tidal Carbon Dioxide Measurement on Resuscitation Efficiency and Termination of Resuscitation

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SUMMARY

Objectives
In this study, the value of end-tidal carbon dioxide (ETCO2) levels measured by capnometry were evaluated as indicators of resuscitation effectiveness and survival in patients presenting to the emergency department with cardiopulmonary arrest.

Methods
ETCO2 was measured after 2 minutes of compression or 150 compressions. ETCO2 values were measured in patients that were intubated and in those who underwent chest compression. The following parameters were recorded for each patient: demographic data, chronic illness, respiration type, pre-hospital CPR, arrest rhythm, arterial blood gas measurements, ETCO2 values with an interval of 5 minutes between the measurement and the estimated time of arrest, time to return to spontaneous circulation.

Results
Cardiac arrest developed in 97 cases, including 56 who were out of the hospital and 41 who were in the hospital. Fifty of these patients returned to spontaneous circulation, and just one of these had an initial ETCO2 value below 10 mmHg. The mean of the final ETCO2 levels was 36.4±4.46 among Patients who Return to Spontaneous Circulation (RSCPs) and 11.74±7.01 among those that died. In all rhythms; Asystole, pulseless electrical activity (PEA) and VF/VT; Overall, RSCPs had higher ETCO2 levels than the cases who died. Among the PEA patients undergoing in-hospital arrests and those asystolic patients undergoing out of hospital arrest, the ETCO2 values of the RSCPs were significantly higher than those of the cases who died.

Conclusions
ETCO2 levels predicted survival as well as the effectiveness of CPR for patients who received CPR and were monitored by capnometry in the emergency department. As a result, we believe that it would be suitable to use capnometry in all units where the CPR is performed.

Key words: Capnography; capnometry; cardiopulmonary arrest; resuscitation.

ÖZET

Amaç
Çalışmamızda acil servise kardiyopulmoner arrest ile gelen hastalarda kapnometre ile ölçülen endtidal karbondioksit seviyelerinin uygulanan KPR’nin etkinliği ve hasta sağkalımını gösterge olarak kullanılabileceğinin araştırılması amaçlanmıştı.

Gereç ve Yöntem
Acil servisinde göğüs kompresyonuna başlanarak entübe edilen (acil ambulansla getirilmiş ve üst kontrolu yapılan) ve göğüs kompresyonunun ikinci dakiğinin sonunda ya da 150 bası sonrası ilk ölçülen end-tidal karbondioksit (ETCO2) değeri 0. dakika ETCO2 olarak kabul edildi. Daha sonra beş dakika aralıklarla ETCO2 değerleri kaydedildi. Hastaların demografik verileri, kronik hastalık varlığı, 112 ile gelmişse neyle solutulduğunu, hastane onceki KPR uygulanması, hastaların arrest ritmi, kan gazı ölçümleri, hasta spanan dolaşımın dönme süresini içeren parametreler kaydedildi.

Bulgular
Çalışmaya alınan 97 olgunun %56’sı hastane dışı (HDKA), %41 hastane içi geri dönüş olan hastalardan (HIKA) hastalarдан oluşmaktadır. Spontan dönüş olanların %50’si, SDGD 50 olgunun sadece bir tanesi içeren, ETCO2 değerleri 10 mmHg’nin altında olarak ölçüldü. Son ETCO2 düzeyiortalamaları SDGD’lerde 36.4±4.46, hayatın kaybedildiği 11.74±7.01 olarak bulundu. Asistol, NEA, VF/VT ritimlerinin tamamında SDGD olgularında ETCO2 düzeyleri exitus olanların %0.001’sidir. Hastane içi nöbetsiz elektriksel aktivite (NEA) hastalarından ve hastane dışı asistol hastalarından, SDGD olgularında ETCO2 değerleri eksiksin olan olguların %0.001’si altındaydı.

Sonuç
Acil servisle KPR uygulanan kapnometre ile izlenen hastalarda ETCO2 düzeyi sağ kalma, KPR’nin etkinliği ve devami açısından yol göstericidir bu yüzden KPR uygulanan tüm birimlerde kapnometre kullanımının uygun olacağı düşünülmüştür.

Anahtar sözcükler: Kardiopulmoner arrest; kapnometre; resüsitasyon.
Introduction
Modern cardiopulmonary resuscitation (CPR) began with airway opening methods by Peter Safar in 1959 and external cardiac compression by William Kouwen hoven in 1960. However, resuscitation trials have been reported for several centuries.[1,2] Since modern resuscitation applications have been used, researchers have been studying ways to prevent cardiac arrest and have been working to develop effective resuscitation techniques.

Capnometry is a method used to verify the accuracy of the endotracheal tube placement in cardiopulmonary arrest patients.[3] High end-tidal carbon dioxide (ETCO2) level measurements by capnometry may be important to successful resuscitations.[4-6] In this study, we aimed to investigate the effect of quantitative ETCO2 measurement with capnometry during CPR to determine the effectiveness of CPR and patient prognosis in cardiopulmonary arrest patients.

Materials and Methods
After obtaining approval from the ethics committee and conforming to the provisions of the Declaration of Helsinki in 1995 (as revised in Seoul 2008), non-traumatic out-of hospital and in-hospital cardiopulmonary arrest patients over 18 years of age were enrolled in this cross-sectional study between February 1, 2012 and June 30, 2012.

Resuscitations were performed according to the American Heart Association (AHA) Advanced Cardiac Life Support (ACLS) guidelines. ETCO2 levels were measured and the time of admission to the emergency department was noted as was the time of intubation. ETCO2 values were recorded after the 6th ventilation in patients who underwent cardiopulmonary arrest during the emergency service follow-up. ETCO2 levels were measured and noted in five minute intervals starting at the time of resuscitation. Resuscitation time was determined by the responsible doctor who managed the resuscitation. Patients who underwent a second cardiopulmonary arrest and were resuscitated were excluded from the study.

The patients were divided into two groups: 1. Exitus patients (EP), and 2. Returned to spontaneous circulation patients (RSCP). Demographic data, chronic disease, ventilation method in the ambulance, out-of hospital CPR application, arrest rhythm, blood gases, ETCO2 levels recorded at intervals of five minutes, predicted arrest time period and return time of spontaneous circulation were recorded. Patients brought by ambulance who then underwent cardiac arrest in the emergency department were accepted as in-hospital cardiac arrest patients.

We used a standard capnography device (Medilab Cap 10) for ETCO2 measurements.

SPSS 15.0 for Windows program was used for statistical evaluation. Chi-square test and Fisher’s exact test was used to compare data between groups. One Way Anova and independent sample t-tests were used for parametric variables. Kruskal Wallis and Mann Whitney U-tests were used to compare nonparametric variables. Results were considered statistically significant at p<0.05.

Results
In our study, 37 (38.1%) of the 97 patients were female, and 60 (61.9%) were male. The mean age of the males was 66.75±13.84 years (min: 56, max: 89) and was 71.57±11.52 years (47-87) for females. The overall mean age of males and females combined was 68.59±13.15 years (26-89). The ages of the males and females were not significantly different (p>0.05).

Forty-one (42.3%) patients were In-hospital cardiac arrest patients (IHCAP) and 56 (55.7%) were Out-hospital cardiac arrest patients (OHCAP). Twenty-two (75%) of the in-hospital arrest patients died and 19 (72%) of them returned to spontaneous circulation. Twenty-five (66.64%) out-of hospital patients (OHCAP) died and 31 (63.55%) returned to spontaneous circulation. The mean ages of the patients who died and those who returned to spontaneous circulation were not significantly different (p>0.05).

Survival due to ventilation techniques (Laryngeal Mask Airway, Bad Valve, Combitube, etc.) performed on patients in the ambulance before admission to the emergency department admission of the IHCAPs and OHCAPs were not significantly different (p>0.05).

In our study ages of 72 (74.6%) patients were over 60 years of age. Seventy-one (73.2%) patients were brought to our emergency department by ambulance. There were no significant differences in the survival of the groups with regards to admission time, arrival by ambulance, location of cardiac arrest, and the diagnosis and presence of chronic disease (p>0.05). However, the survival of the patients with regards to arrest time period were significantly different (p<0.05).

CPR application ratios were not significantly different between the groups in OHCAPs (p>0.05). Survival due to arrest rhythm (p<0.05) and arrest time period ratios (p<0.05) were significantly different between groups (p<0.001). Eighty-one percent of asystole patients, 36% of pulseless electric activity (PEA) patients and 58% of the VF/VT patients died.

The exitus cases’ arrest rhythms were 36.2% (n=17) asystole, 40.4% (n=19) PEA, and 23.4% (n=11) VF/VT. Of 50 RSCPs, 27
(54%) returned to spontaneous circulation in the first 15 minutes, 37 (74%) in first 20 minutes and 45 (90%) in the first 30 minutes.

The mean first ETCO₂ measurement of RTSC patients was 18.6±9.13 and the mean final ETCO₂ was 36.4±4.46. The mean first ETCO₂ value of exitus patients was 15.91±8.35 and the mean final ETCO₂ value was 11.74±7.06 mm/Hg.

The difference between the first ETCO₂ (18.6±9.13) and the last ETCO₂ (36.4±4.46) levels were significantly different in RSCPs (p<0.05) and in EPs (p<0.05).

The ETCO₂ levels of RSCPs varied between 26-48 mmHg (mean: 36.4±4.46). Age (p<0.05) and 45th min ETCO₂ levels (p<0.05) of IHCAPs were higher than those of the OHCAPs in the EP group. The mean age of the IHCAPs was 75.0±7.0 years (57-87) and this value was 66.64±14.56 years (26-87) for OHCAPs. In the RSCP group, age (p<0.05), and the first (p<0.05), 5th (p<0.05), 10th (p<0.05), and 20th (p<0.05) ETCO₂ levels were significantly higher in IHCAPs than in OHCAPs (Table 1).

There were significant differences between the EP and RSCP groups with regards to gender, admission time, arrest rhythm, chronic disease and ventilation technique in the ambulance according to arrest place (in hospital/out-of hospital) (Table 2).

ETCO₂ levels of the RSCP group ranged between 26-48 mmHg (36.4±4.46), and this level for the EP group was 2-23 mmHg (11.74±7.01). The final ETCO₂ level was related with survival (p<0.05).

In the asystole patients, the 15th, 20th, and 25th min ETCO₂ (p=0.009, p=0.028, p=0.033) levels were higher in RSCPs than in EPs. In PEA patients, the 10th, 15th, 20th, and 30th min ETCO₂ levels (p=0.002, p=0.001, p=0.002, p=0.005) were higher in RSCPs than EPs, and in VF/VT patients, the 15th and 30th min ETCO₂ values (p=0.044, p=0.038) were higher in RSCPs than in EPs (Table 3).

In the IHCAPs, the PEA patients' first, 5th, 10th, 15th, 20th and 30th min ETCO₂ levels (p=0.034, p=0.014, p=0.001, p=0.001, p=0.002, p=0.013) were higher in RSCPs than EPs (Table 4).

In the OHCAPs, the asystolic patients' 15th, 20th and 25th min ETCO₂ levels (p=0.011, p=0.033, p=0.038) were higher in RSCPs than in EPs (Table 5).

The 5th, 10th, 15th, 20th, 25th, 30th, 35th, 40th and 45th min ETCO₂ levels (p=0.001, p=0.001, p=0.001, p=0.001, p=0.001, p=0.001, p=0.003, p=0.001, p=0.030) of EPs were lower than those of the RSCPs. The mean final ETCO₂ level of RSCPs was 36.4±4.46 mmHg.

**Discussion**

Cardiopulmonary arrest cases are common in the emergency department and should be attended to immediately. Cardiopulmonary arrest can result in death without rapid and effective intervention.[7] Survival decreases 6-7% per minute in patients that did not undergo chest compression.[8,9]

In our study, 56 (58%) of 97 cases were OHCAPs. Survival is related with pre-hospital factors in OHCAPs.[11-13] These factors include arrival time, basic life support education of the general public and medical service personnel,

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### Table 1. Age and ETCO₂ level distributions of RSCPs and EPs according to place of arrest

| Arrest place | In-hospital | Out-of-hospital | Total |
|--------------|-------------|-----------------|-------|
|              | Mean±SD     | Min. Max.       | Mean±SD | Min. Max. | p     |
| **EPs**      |             |                 |        |            |       |
| Age          | 75.0±7.0    | 57 87           | 66.64±14.56 | 26 87 | 70.55±12.28 | 26 87 | 0.038 |
| ETCO₂ 45 min | 22.5±6.36   | 18 27           | 9.25±4.5 | 4 18 | 11.9±7.17 | 4 27 | 0.044 |
| **RSCPs**    |             |                 |        |            |       |
| Age          | 71.95±12.4  | 47 89           | 63.55±13.81 | 39 86 | 66.74±13.79 | 39 89 | 0.047 |
| ETCO₂ 0 min  | 24.47±8.79  | 5 36            | 15±7.38 | 3 35 | 18.6±9.13 | 3 36 | 0.001 |
| ETCO₂ 5 min  | 25.84±7     | 6 35            | 19.13±5.89 | 7 35 | 21.68±7.08 | 6 35 | 0.0001 |
| ETCO₂ 10 min | 30.17±8.33  | 18 44           | 23.57±7.86 | 13 48 | 26.04±8.58 | 13 48 | 0.011 |
| ETCO₂ 20 min | 33.88±8.64  | 20 43           | 25±7.57 | 14 36 | 28.09±8.88 | 14 43 | 0.023 |

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Table 2. Gender, arrival time, arrest rhythm and chronic disease ratio distribution of RSCPs and EPs according to place of arrest

| Arrest place | In-hospital | Ou-of-hospital | Total | p  |
|--------------|-------------|----------------|-------|----|
|              | n  | %      | n  | %      | n  | %     |
| EPs          |    |        |    |         |    |        |
| Gender       |    |        |    |         |    |        |
| Female       | 8  | 47.1   | 9  | 52.9    | 17 | 36.2   | 0.979 |
| Male         | 14 | 46.7   | 16 | 53.3    | 30 | 63.8   |
| Arrive time  |    |        |    |         |    |        |
| 00:01-04:00  | 2  | 28.6   | 5  | 71.4    | 7  | 14.9   | 0.486 |
| 04:01-08:00  | 1  | 25.0   | 3  | 75.0    | 4  | 8.5    |
| 08:01-12:00  | 9  | 69.2   | 4  | 30.8    | 13 | 27.7   |
| 12:01-16:00  | 4  | 44.4   | 5  | 55.6    | 9  | 19.1   |
| 16:01-20:00  | 4  | 44.4   | 5  | 55.6    | 9  | 19.1   |
| 20:01-24:00  | 2  | 40.0   | 3  | 60.0    | 5  | 10.6   |
| Arrest rhythm|    |        |    |         |    |        |
| Asystole     | 1  | 5.9    | 16 | 94.1    | 17 | 36.2   | 0.001 |
| NEA          | 18 | 94.7   | 1  | 5.3     | 19 | 40.4   |
| VF/VT        | 3  | 27.3   | 8  | 72.7    | 11 | 23.4   |
| Arrest time period |    |        |    |         |    |        |
| 0 min        | 22 | 100.0  | 0  | 0.0     | 22 | 46.8   | 0.001 |
| 0-5 min      | 0  | 0.0    | 2  | 100.0   | 2  | 4.3    |
| 6-10 min     | 0  | 0.0    | 7  | 100.0   | 7  | 14.9   |
| 11-15 min    | 0  | 0.0    | 13 | 100.0   | 13 | 27.7   |
| 16-20 min    | 0  | 0.0    | 3  | 100.0   | 3  | 6.4    |
| Chronic disease |    |        |    |         |    |        |
| No           | 7  | 43.8   | 9  | 56.3    | 16 | 34.0   | 0.763 |
| Yes          | 15 | 48.4   | 16 | 51.6    | 31 | 66.0   |
| RSCPs        |    |        |    |         |    |        |
| Gender       |    |        |    |         |    |        |
| Female       | 8  | 40.0   | 12 | 60.0    | 20 | 40.0   | 0.812 |
| Male         | 11 | 36.7   | 19 | 63.3    | 30 | 60.0   |
| Arrive time  |    |        |    |         |    |        |
| 00:01-04:00  | 1  | 16.7   | 5  | 83.3    | 6  | 12.0   | 0.716 |
| 04:01-08:00  | 1  | 20.0   | 4  | 80.0    | 5  | 10.0   |
| 08:01-12:00  | 2  | 33.3   | 4  | 66.7    | 6  | 12.0   |
| 12:01-16:00  | 4  | 40.0   | 6  | 60.0    | 10 | 20.0   |
| 16:01-20:00  | 5  | 50.0   | 5  | 50.0    | 10 | 20.0   |
| 20:01-24:00  | 6  | 46.2   | 7  | 53.8    | 13 | 26.0   |
| Arrest rhythm|    |        |    |         |    |        |
| Asystoli     | 0  | 0.0    | 4  | 100.0   | 4  | 8.0    | 0.006 |
| NEA          | 18 | 52.9   | 16 | 47.1    | 34 | 68.0   |
| VF/VT        | 1  | 8.3    | 11 | 91.7    | 12 | 24.0   |
| Arrest time period |    |        |    |         |    |        |
| 0 min        | 18 | 100.0  | 0  | 0.0     | 18 | 36.0   | 0.001 |
| 0-5 min      | 1  | 6.3    | 15 | 93.8    | 16 | 32.0   |
| 6-10 min     | 0  | 0.0    | 10 | 100.0   | 10 | 20.0   |
| 11-15 min    | 0  | 0.0    | 4  | 100.0   | 4  | 8.0    |
| 16-20 min    | 0  | 0.0    | 2  | 100.0   | 2  | 4.0    |
| Chronic disease |    |        |    |         |    |        |
| No           | 5  | 35.7   | 9  | 64.3    | 14 | 28.0   | 0.836 |
| Yes          | 14 | 38.9   | 22 | 61.1    | 36 | 72.0   |
presence of resuscitation centers, and the presence of automatic external defibrillator in public places.

The duration between the time of cardiac arrest and alerting the emergency medical service is the first step of survival, and is directly related to the long term prognosis of cardiac arrest patients. One study reported that survival significantly decreased if the emergency service was not called within 6 minutes in OHCAPs.\textsuperscript{[14]} In our study, there was a significant difference between survival ratios of the groups according to Table 3.

### Table 3. ETCO\(_2\) levels of arrest rhythms' according to survival

|                  | EPs         | RSCPs       | Total        | p     |
|------------------|-------------|-------------|--------------|-------|
|                  | n | Mean±SD | n | Mean±SD | n | Mean±SD |       |
| Arrest rhythm = Asystole |       |        |       |       |       |       |       |
| 15 min           | 17 | 12.82±7.64 | 4 | 23.75±4.57 | 21 | 14.9±8.32 | 0.009 |
| 20 min           | 17 | 12.12±8.08 | 3 | 25.67±7.02 | 20 | 14.15±9.21 | 0.028 |
| 25 min           | 14 | 10.36±5.92 | 2 | 31±16.97  | 16 | 12.94±9.96 | 0.033 |
| Arrest rhythm = PEA |       |        |       |       |       |       |       |
| 10 min           | 19 | 16.84±8.29 | 33 | 26.39±9.18 | 52 | 22.9±9.94 | 0.002 |
| 15 min           | 19 | 16.84±7.75 | 25 | 27.28±8.87 | 44 | 22.77±9.82 | 0.001 |
| 20 min           | 19 | 16.58±8.66 | 16 | 29.31±9.56 | 35 | 22.4±11.02 | 0.002 |
| Arrest rhythm = VF/VT |       |        |       |       |       |       |       |
| 15 min           | 11 | 18.45±6.36 | 7 | 28.29±9.76 | 18 | 22.28±9.04 | 0.044 |
| 30 min           | 11 | 13.45±6.67 | 3 | 29.33±9.07 | 14 | 16.86±9.62 | 0.038 |

### Table 4. ETCO\(_2\) levels of arrest rhythms' in IHCAPs according to survival

|                  | EPs         | RSCPs       | Total        | p     |
|------------------|-------------|-------------|--------------|-------|
|                  | n | Mean±SD | n | Mean±SD | n | Mean±SD |       |
| Arrest rhythm = PEA |       |        |       |       |       |       |       |
| 0 min            | 18 | 18.56±8.1 | 5 | 34 | 18 | 24.22±8.974 | 5 | 36 | 36 | 21.39±8.9 | 5 | 36 | 0.034 |
| 5 min            | 18 | 18.56±8.09 | 5 | 30 | 18 | 25.39±6.912 | 6 | 35 | 36 | 21.97±8.19 | 5 | 35 | 0.014 |
| 10 min           | 18 | 17.56±7.91 | 5 | 33 | 18 | 30.12±8.587 | 18 | 44 | 35 | 23.66±10.32 | 5 | 44 | 0.001 |
| 15 min           | 18 | 17.5±7.41 | 6 | 31 | 12 | 30.42±6.788 | 20 | 40 | 30 | 22.67±9.54 | 6 | 40 | 0.001 |
| 20 min           | 18 | 17.28±8.34 | 5 | 31 | 7 | 34.43±9.181 | 20 | 43 | 25 | 22.08±11.5 | 5 | 43 | 0.002 |
| 30 min           | 16 | 17.31±7.64 | 4 | 32 | 2 | 35±1.414 | 34 | 36 | 18 | 19.28±9.18 | 4 | 36 | 0.013 |

### Table 5. ETCO\(_2\) levels of arrest rhythms' in OHCAPs according to survival

|                  | EPs         | RSCPs       | Total        | p     |
|------------------|-------------|-------------|--------------|-------|
|                  | n | Mean±SD | n | Mean±SD | n | Mean±SD |       |
| Arrest rhythm = Asystole |       |        |       |       |       |       |       |
| 15 min           | 16 | 13.31±7.61 | 3 | 29 | 4 | 23.75±4.573 | 19 | 30 | 20 | 15.4±8.21 | 3 | 30 | 0.011 |
| 20 min           | 16 | 12.69±7.98 | 2 | 31 | 3 | 25.67±7.024 | 19 | 33 | 19 | 14.74±9.07 | 2 | 33 | 0.033 |
| 25 min           | 13 | 10.85±5.86 | 2 | 24 | 2 | 31±16.971 | 19 | 43 | 15 | 13.53±10.01 | 2 | 43 | 0.038 |
to the period between arrest and the call to emergency services.

In the meta-analysis by Sasson et al, although 53% (n=75.800) of 143.000 cases were reported as witnessed arrest cases, only 32% (n=24.250) of the cases were resuscitated at the arrest place by a rescuer. In our study, 13 cases who were not brought to the hospital in an ambulance did not undergo cardiopulmonary resuscitation before arrival. Survival has been reported to be less than 5% in OHCAPs. In our hospital, survival was 32% (n=31) in OHCAPs.

In OHCAPs, low survival is related with the presence of asystole and PEA as the first rhythm. In our study, there was no significant difference between the RSCP and EP groups according to arrest rhythm and arrest time period in IHCAPs. However, there was a significant difference between these groups in OHCAPs. In OHCAPs, 80% of asystolic patients died, while 94.1% of PEA patients and 57.9% of VF/VT patients returned to spontaneous circulation.

Similar to the study by Takei et al., we also found a relationship between arrest time period and survival. Return to spontaneous circulation rate decreases and exitus ratio increases with a longer arrest time period. Mortality was high in asystole and PEA.

In our study, 27 (54%) of 50 cases returned to spontaneous circulation within the first 15 mins, 37 (74%) returned in the first 20 mins, and 45 (90%) patients returned in the first 30 mins. The return to spontaneous circulation ratio decreased with longer cardiopulmonary resuscitation times.

Hodgetts et al. reported that survival of IHCAPs was high. The presence of a chronic disease negatively affects survival, and the best chances at survival are provided with early defibrillation. In our study, when we considered the arrest places of the EPs, age and 45th min ETCO2 levels of IHCAPs were significantly higher than those of OHCAPs. In RSCPs, the first, 5th, 10th and 20th min ETCO2 levels of IHCAPs were higher than those of OHCAPs. Similar to the literature, in our study, the ETCO2 level of RSCPs varied between 26-48 mmHg (36.4±4.46).

A sudden increase in ETCO2 indicates the return to spontaneous circulation. White reported that rhythm changes and ETCO2 levels can be used as an early indication of pulmonary perfusion even in pulseless cases, but only in OHCAPs. Also, a relationship between coronary perfusion pressure and ETCO2 has been reported. If ETCO2 remains under 10 mmHg for a long time during CPR, it is quite likely that a return to spontaneous circulation will not occur. One study reported that just one case survived whose ETCO2 level remained under 10 mmHg. In our study, just one of the RSCPs’ ETCO2 levels was under 5 mmHg. Similar to the literature, we found a relationship between final ETCO2 level and survival.

Heradstveit et al reported significant differences between RSCPs and ETCO2 in all asystole, PEA, and VF/VT rhythms. When we grouped cases according to arrest rhythms, the 15th, 20th, and 25th min ETCO2 levels of asystole patients, the 10th, 15th, 20th, and 30th min ETCO2 levels of PEA patients, and the 15th and 30th min ETCO2 levels of VF/VT patients were higher in RSCPs than in EPs. When we considered the IHCAPs according to arrest rhythm, the first, 5th, 10th, 15th, 20th and 30th min ETCO2 levels of PEA patients were higher in RSCPs than in EPs. In OHCAPs, the 15th, 20th and 25th min ETCO2 levels of asystole patients were higher in RSCPs than in EPs.

Conclusion

As suggested in the guidelines, ETCO2 follow-up of the cardiopulmonary arrest patients with capnography would be helpful in the continuation of CPR and in predicting the survival of the patient. Capnography use is suitable in emergency services and in ambulances.

Limitations

Patients were excluded if they underwent a second cardiopulmonary arrest, and this limited our study, as we could not determine the effectiveness of ETCO2 measurements in these patients.

Conflict of Interest

The authors declare that there is no potential conflicts of interest.

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