Does The End-Tidal CO_2 Monitoring Have Prognostic Value during Out-of-Hospital Cardiac Arrest?

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Introduction: Management of cardiac arrest is made difficult by the absence of a readily available, non-invasive measurement that identifies individual patients who are likely to be resuscitated successfully. Animal and clinical studies have suggested that end-tidal CO_2 ($EtCO_2$) correlates closely with cardiac output during resuscitation efforts. To investigate further the utility of $EtCO_2$ as a prognostic indicator of initial outcome of resuscitation and survival in patients, we conducted a prospective study of the use of $EtCO_2$ in adult victims of out-of-hospital, non-trauma-related cardiac arrest.

Methods. We prospectively studied 238 adult (age >18years) patients in non-trauma-related, out-of hospital cardiac arrest (in from January 1998–December 1999). $EtCO_2$ was monitored with an in-line sensor and was calibrated every 48 hours according to the manufacturer's specification (BCI 82000 Capnometer, BCI International). For each patient, the following measures were recorded: 1) age; 2) gender; 3) $EtCO_2$ (initial, final); 4) cardiac rhythm; 5) return of spontaneous circulation (ROSC); and 6) survival. Data were analyzed to compare patients who died (NS, NR) with those were resuscitated successfully (R), and with survival (S). Data were analyzed using the unpaired, two-tailed, Student's *t*-test; O_2-test; $p < 0.05$.

Results: 238 patients were included in the study (144 (61%) males, and 94 (39%) females). Survivors were younger than non-survivors(56 ±15 vs.69 ±11 years; $p < 0.05$). The mean values for $EtCO_2$ are in Table 1.

Table 1

Group	Number	Initial $EtCO_2$ mean	SD	Final $EtCO_2$ mean	SD
All (n =238)					
R	68	18.8	6.2	24.1	5.1
NR	170	7.4	2.4	5.8	4.3
S	26	22.2	3.7	28.4	4.3
NS	212	8.7	2.3	7.2	4.2
Asystole (n = 132)					
R	28	15.2	6.3	21.2	6.2
NR	104	6.4	2.1	5.2	3.5
S	3	17.8	3.7	22.5	4.5
NS	129	7.2	3.7	6.3	4.2
VF (n = 55)					
R	22	17.2	4.5	28.6	10.3
NR	33	7.3	2.5	5.4	2.3
S	14	19.4	5.4	31.2	10.1
NS	41	8.4	4.1	7.2	3.2
VT (n = 12)					
R	8	21.5	7.4	26.2	8.7
NR	4	9.8	3.9	6.2	2.2
S	6	26.2	6.3	27.8	7.5
NS	6	11.3	4.7	8.2	5.5
EMD (n = 39)					
R	10	22.7	5.8	31.2	8.1
NR	29	6.3	1.9	7.1	2.3
S	3	24.3	6.5	35.2	6.3
NS	36	9.3	3.5	7.3	4.2

The initial and final $EtCO_2$ was significantly higher in patients with ROSC than in patients without ROSC ($p < 0.05$). The initial and final $EtCO_2$ also was greater for those patients who survived to leave the hospital compared with those patients who died ($p < 0.05$).

Conclusion: Data from this prospective clinical trial indicate that $EtCO_2$ monitoring during CPR correlates with resuscitation from and survival of cardiac arrest. End-tidal CO_2 monitoring has potential as a non-invasive indicator of cardiac output during resuscitation and a prognostic indicator for survival.

Keywords: cardiac arrest; $EtCO_2$; prognosis; ROSC; survival
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