A user-independent algorithm for detection of oesophageal intubation based on ventilation pressure waveforms

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AS070

Mouth-to-mouth ventilation reduces interruptions in chest compressions during lifeguard CPR: A randomized manikin study

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Introduction: The quality of cardiopulmonary resuscitation (CPR) is a crucial determinant of the outcome following cardiac arrest. Interruptions in chest compressions are detrimental. The aim of this study was to compare the effect of mouth-to-mouth ventilation (MMV), mouth-to-pocket-mask ventilation (MPV) and bag-mask ventilation (BMV) on CPR quality.

Materials and methods: Surf lifeguards in active service were included in the study. Each surf lifeguard was randomised to perform three sessions of single rescuer CPR using each of the three ventilation methods (MMV, MPV and BMV) separated by 5 min of rest. Data were obtained from a resuscitation manikin and video recordings.

Results: In total 50 surf lifeguards were included (35 males, 15 female, mean age 25.4 years). Interruptions in chest compressions were significantly reduced by MMV (8.6 ± 1.6 s) when compared to MPV (10.7 ± 3.2 s, $p < 0.001$) and MBV (12.4 ± 3.6 s, $p < 0.001$). No significant differences were observed in chest compression depth and rate. Significantly more effective ventilations (visible chest rise) were delivered using MMV (93%) when compared to BMV (59%, $p < 0.0001$) while no differences were observed when compared to PMV (80%, $p = 0.14$). Tidal volumes were significantly lower following BMV (0.42 ± 0.16 L, $p < 0.001$ for both) compared to MMV (0.65 ± 0.21 L) and PMV (0.62 ± 0.26 L), while no differences were observed when comparing MMV and PMV.

Conclusion: MMV reduces interruptions in chest compressions during lifeguard CPR. Furthermore, MMV seems to results in a higher proportion of effective ventilations. Our results suggest that CPR quality is improved using MMV compared to PMV and BMV.

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AS071

A user-independent algorithm for detection of oesophageal intubation based on ventilation pressure waveforms: Validation in a prehospital setting

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Purpose of the study: Emergency prehospital intubation may result in accidental oesophageal intubation in up to 17% of patients, causing significant morbidity and mortality.[1] There is no single highly sensitive and specific method of detecting accidental oesophageal intubation in prehospital emergency conditions, especially during cardiac arrest.[2] We reported earlier on the development of an algorithm for differentiating oesophageal from tracheal intubation based on ventilation pressure profiles in patients undergoing elective surgery.[3] The aim of the current study was to present an improved algorithm in a higher number of patients and to validate it in a prehospital population.

Materials and methods: The study was approved by the respective Ethics Committees. To develop the algorithm, twenty patients scheduled for elective surgery were intubated endotracheally and 20 patients were intubated purposely in the oesophagus using an Easytube (Rüsch, Germany). Proximal and distal airway pressures were recorded using a thin air-filled catheter inserted into the tube. The pressure waveforms of the first three manual ventilations were analysed using custom Visual Basic code. For every ventilation cycle, a parameter *D* discriminating between oesophageal and tracheal ventilation was calculated based on temporal (dP/dt) and spatial (dP/ds) pressure gradients during insufflation and exhalation. To validate parameter *D*, airway pressures were recorded in 28 prehospital patients (15 with and 13 without cardiac arrest) using the same method.

Results: During development of the algorithm, oesophageal ventilations had *D*-values < 1 (range 0.003–0.3), whereas tracheal ventilations had *D*-values > 1 (range 2.4–174.0). During validation in prehospital patients, all tracheal ventilations had *D*-values > 1 (range 1.2–124.5).

Conclusions: The algorithm discriminated between tracheal and oesophageal intubation with high accuracy in patients undergoing elective intubation, and diagnosed tracheal intubation correctly in prehospital patients during emergency intubation. This method is user-independent and provides a diagnosis within seconds.

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Drugs

AS072

Total epinephrine dose during resuscitation is associated with unfavorable functional outcome after cardiac arrest with asystole and pulseless electric activity in humans

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Purpose of the study: Epinephrine is the drug of choice during advanced cardiac life support. The cumulative dose of epinephrine applied during resuscitation was shown to be independently associated with unfavorable outcome after ventricular fibrillation cardiac arrest in humans. Our objective was to investigate the association between the cumulative dose of epinephrine applied during resuscitation and in-hospital mortality and functional outcome, in patients with asystole and pulseless electric activity.

Materials and methods: This retrospective cohort study is based on a cardiac arrest registry of the emergency department at the Vienna General Hospital/Medical University of Vienna. It comprises 946 patients admitted to the emergency department after resuscitation of witnessed cardiac arrest with asystole or pulseless electric activity. Data were documented according to Utstein Style. The risk factor was cumulative epinephrine categorized into quartiles. The endpoints were in-hospital mortality and unfavorable functional outcome.

Results: The median cumulative amount of epinephrine administered was 2 mg (IQR 0–5), ranging from 1 to 50 mg. Of all patients 649 (69%) died during hospital stay, 643 (69%) had an unfavorable functional outcome. The multivariate analysis showed a statistically significant increasing risk for in-hospital mortality and unfavorable functional outcome with increasing cumulative doses of epinephrine (in hospital mortality: OR 1–1.54–2.73–4.42 over quartiles of epinephrine; unfavorable functional outcome: OR 1–1.8–3.66–6.45 over quartiles of epinephrine).

Conclusion: Our results show that an increasing cumulative dose of epinephrine during resuscitation of patients with asystole and pulseless electric activity is an independent risk factor for in-hospital death and unfavorable functional outcome.

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AS073

Patient outcome when adrenaline is actually given vs. not given in a randomised study

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Purpose of the study: In a recent randomized controlled trial (RCT) long-term outcome did not improve with IV drug treatment after out-of-hospital cardiac arrest (OHCA) in intention-to-treat analysis .[1] This post hoc analysis of the same data1 compares outcomes for patients actually treated with adrenaline to those not treated with adrenaline.

Materials and methods: Patients from a recently published RCT1 were included. Three patients from the original study were excluded from analysis due to insufficient documentation of adrenaline administration. Patient records and continuous electrocardiograms (ECGs) with impedance signals were reviewed. Quality of cardiopulmonary resuscitation (CPR) and clinical outcomes were compared.

Results: Clinical characteristics were similar for 367 patients receiving adrenalin and 481 patients not receiving adrenalin, with comparable CPR quality within guideline recommendations for both groups. Odds ratios (95% confidence interval) for hospital admission, survival to hospital discharge, and survival with favourable neurological outcome for adrenalin vs. no-adrenalin were 2.51 (1.89, 3.35), 0.49 (0.30, 0.81) and 0.41 (0.24, 0.70), respectively. Ventricular fibrillation, response interval, witnessed arrest, gender, age and endotracheal intubation were confounding factors in multivariate logistic regression analysis. When controlling for these confounders odds ratio for hospital discharge for adrenalin vs. no-adrenalin was 0.52 (95% CI 0.29, 0.92).

Conclusion: Adrenaline treatment was associated with improved short-term survival, but decreased survival to hospital discharge and survival with favourable neurological outcome after OHCA. This is at least partly due to a significant number of patients randomized to drugs with rapid return of spontaneous circulation before drug could be given, and indicates that retrospective data analysis of drug vs. no drug as previously published by others is unreliable even if controlling for other factors known to influence outcome.

Reference

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