

REGISTRES, REVISIONS I EDITORIALS

1. **Prehosp Emerg Care.** 2018 Apr 6:1-10. doi: 10.1080/10903127.2018.1448913. [Epub ahead of print]

Intrastate Variation in Treatment and Outcomes of Out-of-Hospital Cardiac Arrest.

Coute RA, Shields TA, Cranford JA, Ansari S, Abir M, Tiba MH, Dunne R, O'Neil B, Swor R, Neumar RW; SaveMiHeart Consortium and the CARES Surveillance Group.

Abstract

OBJECTIVE: Our objective was to analyze and compare out-of-hospital cardiac arrest (OHCA) system of care performance and outcomes at the Medical Control Authority (MCA) level in the state of Michigan. We hypothesized that clinically and statistically significant variations in treatment and outcomes of OHCA exists within a single U.S. state.

METHODS: We performed a retrospective, observational study of all non-traumatic EMS-treated OHCA from the state of Michigan CARES registry for 2014-2015. Geocoding of the OHCA incident address was used to assign records to individual MCAs. MCA-based demographics, arrest characteristics, system of care performance and outcomes were quantified and compared. Associations between demographics, system of care parameters, and outcomes were examined at the MCA level.

RESULTS: A total of 8,115 records with complete data were available for analysis. Eleven MCAs met study inclusion criteria of >100 cases, producing a final sample size of 7,788 records (96%). Statistically significant variations in survival to hospital discharge ranged from 4.5% to 15% ($p < 0.001$) (Adjusted odds ratio [AOR] range 0.6-2.0) and survival with good neurologic outcome 2.7-12.5% ($p < 0.001$; AOR range 0.5-2.2,) were observed across MCAs. Bystander CPR ranged from 32% to 53% ($p < 0.001$) and bystander AED application ranged from 3.5% 11.5% ($p < 0.05$). Of patients admitted to the hospital alive, 29-68% received targeted temperature management. In hospital mortality ranged from 53.1% to 73.9% ($p < 0.05$).

CONCLUSION: Significant intrastate variability in OHCA system of care performance and outcomes currently exist and are similar to what has been previously reported across North America almost a decade ago. This degree of variability highlights the opportunity to optimize modifiable factors within local systems of care to improve OHCA outcomes.

2. **Cardiol J.** 2018 Apr 3. doi: 10.5603/CJ.a2018.0025. [Epub ahead of print]

Epidemiology and chronobiology of out-of-hospital cardiac arrest in a subpopulation of southern Poland: A two-year observation.

Szczerbinski S, Ratajczak J, Lach P, Rzeszuto J, Paciorek P, Karłowska-Pik J, Ziemkiewicz B, Jasiewicz M1, Kubica A.

Abstract

BACKGROUND: Although recent studies indicate temporal variations in the incidence of out-of-hospital cardiac arrest (OHCA), the Polish experience in this research is scarce to date. Epidemiology of OHCA and circadian is evaluated herein, weekly and seasonal variations of OHCA frequency among the adult population of the Opole district, Poland.

METHODS: The retrospective analysis of 815 OHCA cases with presumed cardiac etiology was made based on dispatch cards from the Emergency Medical Center in Opole registered during a 2 year period (2006-2007).

RESULTS: The incidence of OHCA in the studied population was 1.56/1000 inhabitants per year. Mean age of the group was 69.2 ± 14.2 years, with the majority of men (63%), younger than women (66.1 vs. 74 years, $p = 0.0001$). The OHCA occurrence increased with age reaching a peak between 71 and 75 years. The incidence of OHCA stayed stable low levels between 22:00 and 4:59 and started to increase at 5:00, with trimodal peaks: 8:00-10:59, 14:00-15:59 and 18.00-21.59. The lowest number of OHCA occurred from 00:00 to 5:59, the highest from 6:00 to 11:59 (13% vs. 32.4%, $p < 0.001$). The day with the lowest occurrence of OHCA was Friday, the highest Saturday (10.9% vs. 16%, $p = 0.01$). Summer was the season of the lowest incidence of OHCA, while winter - the highest (22.6% vs. 26%, $p = 0.04$). These seasons were the warmest and the coldest one, respectively (average temperature 18.5o vs. 0oC, $p < 0.001$).

CONCLUSIONS: It was confirmed that circadian and less marked, weekly variability in OHCA occurrence. Existing seasonal differences may be affected by temperature. This is the first Polish analysis of a large subpopulation, which also includes seasonal temperature data.

Free Article

3. **Am J Cardiol.** 2018 Mar 2. pii: S0002-9149(18)30254-6. doi: 10.1016/j.amjcard.2018.02.018. [Epub ahead of print]

Characteristics and Outcomes of Out-of-Hospital Cardiac Arrest Occurring While in a Motor Vehicle.

Sado J1, Kiyohara K2, Hayashida S3, Matsuyama T4 , Katayama Y5, Hirose T6, Kiguchi T7, Nishiyama C8, Iwami T7, Kitamura Y1, Sobue T1, Kitamura T9.

Abstract

This study aimed to investigate the incidence, patient characteristics, and outcomes of out-of-hospital cardiac arrest (OHCA) occurring while in a motor vehicle in Osaka City, Japan (with a population of 2.6 million), from 2009 to 2015. The OHCA data used in this study were obtained from the population-based Utstein-style registry in Osaka City. Patients who had OHCA occurring while in a motor vehicle were included. The primary end point was 1-month survival with favorable neurologic outcome after OHCA. During the study period, 18,458 OHCA were observed, and 264 of them (1.4%) occurred while on or in a motor vehicle (drivers, n = 179; nondrivers, n = 85). The overall incidence rate of OHCA occurring while in a motor vehicle was 14.0 per million population per year (drivers, 9.5; nondrivers, 4.5). In the drivers with OHCA, 78 (43.6%) and 101 (56.4%) cases were of medical origin and traffic injuries, respectively. Approximately half of OHCA with a medical origin in drivers presumably occurred while driving (46.2%, 36 of 78). The overall proportion of 1-month survival with favorable neurologic outcome after OHCA was 6.4% (17 of 264). In the drivers, the proportion of OHCA with a medical origin and because of traffic injuries were 11.5% (9 of 78) and 2.0% (2 of 101) (p = 0.008), respectively. In conclusion, although OHCA occurring while in a motor vehicle represented a small subset of the overall OHCA burden, a relatively large number of cardiac arrests with a medical origin occurred in drivers.

DONACIÓ D'ÒRGANS

1. **Medicine** (Baltimore). 2018 Apr;97(14):e0064. doi: 10.1097/MD.00000000000010064.

Suicidal hanging donors for lung transplantation: Is this chapter still closed? Midterm experience from a single center in United Kingdom.

Ananiadou O1, Schmack B1, Zych B1, Sabashnikov A 1, Garcia-Saez D1, Mohite P1, Weymann A1, Mansur A2, Zerriouh M1, Marczin N3,4, De Robertis F1, Simon AR1, Popov AF1,5.

Abstract

In the context of limited donor pool in cardi thoracic transplantation, utilization of organs from high risk donors, such as suicidal hanging donors, while ensuring safety, is under consideration. We sought to evaluate the outcomes of lung transplantations (LTx) that use organs from this group. Between January 2011 and December 2015, 265 LTx were performed at our center. Twenty-two recipients received lungs from donors after suicidal hanging (group 1). The remaining 243 transplantations were used as a control (group 2). Analysis of recipient and donor characteristics as well as outcomes was performed. No statistically significant difference was found in the donor characteristics between analyzed groups, except for higher incidence of cardiac arrest, younger age and smoking history of hanging donors (P < .001, P = .022 and P = .0042, respectively). Recipient preoperative and perioperative characteristics were comparable. Postoperatively in group 1 there was a higher incidence of extracorporeal life support (27.3 vs 9.1%, P = .019). There were no significant differences in chronic lung allograft dysfunction-free survival between group 1 and 2: 92.3 vs 94% at 1 year and 65.9 vs 75.5% at 3 years (P = .99). The estimated cumulative survival rate was also similar between groups: 68.2 vs 83.2% at 1 year and 68.2% versus 72% at 3 years (P = .3758). Hanging as a donor cause of death is not associated with poor mid-term survival or chronic lung allograft dysfunction following transplantation. These results encourage assessment of lungs from hanging donors, and their consideration for transplantation.

2. **Exp Clin Transplant.** 2018 Apr 2. doi: 10.6002/ect.2017.0293. [Epub ahead of print]
Brain Death in Intensive Care Units: Problems, Differences in Methods of Diagnosis, and Donor Care.

Sarıtaş A1, Acar Çinleti B, Zincircioğlu Ç, Uzun U, Köse I, Şenoğlu N.

Abstract

OBJECTIVES: Our aim was to investigate the most common problems in diagnosing brain death, the care of the organ donor, and organ donation after death.

MATERIALS AND METHODS:

A survey was sent randomly to clinicians working in national intensive care units in Turkey. The survey, which consisted of 17 questions for clinicians, had 163 responders.

RESULTS: The most common cause of brain death was traumatic brain injury. Although 22% of clinicians found the apnea test necessary for brain death diagnosis, 78% stated that it could be used as an optional confirmatory test. However, 65.6% of the clinicians were not familiar with the modified apnea test. The most frequently used vasoactive agent for hypotension in patients with brain death was noradrenaline (54.6%) and dopamine (41.6%). Regarding time of death, 50.3% of clinicians considered it as the time and date when the patient was diagnosed with brain death and 47.8% as the time and date of cardiac arrest. When asked whether they terminate the treatment of a patient with brain death when organ donation is rejected, only 16.1% discontinued all advanced life support. According to the survey, the most common reason for not accepting organ transplant was for religious reasons.

CONCLUSIONS: In intensive care units, differences in definitions and care of patients with brain death continue to be a complication. There has been a lack of progress in criterion standards of brain death diagnosis and donor care, as verified by our survey.

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FÀRMACS

1. **Cardiol Rev.** 2018 Mar 30. doi: 10.1097/CRD.000000000000198. [Epub ahead of print]
Xenon: An Emerging Neuroprotectant with Potential Application for Cardiac Arrest Care.

Roostan M1, Frishman WH1.

Abstract

Xenon is an inert, highly polarizable noble gas with demonstrated safety and application in general anesthesia for over fifty years. A potent inhibitor of the N-methyl-D-aspartate subtype of glutamate receptors, xenon has a well-documented ameliorating effect on excitotoxic neuronal injury in numerous cellular and animal models of hypoxic-ischemic brain injury. The most important determinant of overall survival and morbidity in out-of-hospital cardiac arrest is the severity of neurological injury. The only approved neuroprotective strategy in this setting is mild therapeutic hypothermia, which has demonstrated significant, albeit modest, improvements in mortality. The combination therapy of therapeutic hypothermia and xenon in porcine models of cardiac arrest has shown a greater improvement in functional outcomes than either intervention alone, thereby prompting the study of combination therapy in randomized clinical trials. The treatment of post-arrest patients with xenon and mild hypothermia is safe and demonstrates favorable cardiovascular features, including a reduced heart rate, a reduction in troponin elevations, and a decreased need for vasopressors. Combination therapy is superior in protecting white matter integrity than hypothermia alone, but did not significantly impact neurological outcomes at 6-month follow-up. Despite an abundance of preclinical evidence supporting xenon's neuroprotective properties, its translational potential in post-cardiac arrest care is indeterminate due to a lack of adequately-powered studies

TRAUMA

1. **Injury.** 2018 Mar 23. pii: S0020-1383(18)30138-4. doi: 10.1016/j.injury.2018.03.026. [Epub ahead of print]

Femoral arterial and central venous catheters in the trauma resuscitation room.

Hamada SR1, Fromentin M2, Ronot M3, Gauss T4, Harrois A5, Duranteau J5, Paugam-Burtz C4.

Abstract

BACKGROUND: Arterial and central venous femoral catheters (fAC-CVC) use during the initial management of severe trauma patients is not a standard technique in most trauma centers.

Arguments in favor of their use are: continuous monitoring of blood pressure, safe drug administration, easy blood sampling and potentially large bore venous access. The lack of evidence makes the practice heterogeneous. The aim of the present study was to describe the use and complications of fAC-CVC in the trauma bay in two centers where they are routinely used.

METHODS: This was a retrospective analysis of routine fAC-CVC use from two French trauma centers. All patients admitted directly to the trauma resuscitation room were included. Demographic, clinical and biological data were collected from the scene to discharge to describe the use of catheters during initial trauma management including infectious, mechanical and thrombotic complications.

RESULTS: 243 pairs of femoral catheters were inserted among 692 patients admitted in both trauma centers. Femoral AC-CVC use was more frequent in critically ill patients with higher ISS 26 [17; 41] vs 13 [8; 24], $p < 0.001$ (median [quartile 1-3]), severe traumatic brain injury (AIS head 1[0-4] vs 0[0-3], $p < 0.001$), lower systolic blood pressure, 92 (37) vs 113 (28) mmHg, $p < 0.001$ mean (standard deviation), lower haemoglobin on arrival, 10.9 (3) vs 13.3 (2.1) g/dL ($p < 0.001$), and higher blood lactate concentration, 4.0 (3.9) vs 2.1 (1.8) mmol/L ($p < 0.001$). In patients with fAC-CVC use time in the trauma room was longer, 46 [40;60] vs 30 [20;40] minutes ($p < 0.05$). In total 52 colonizations and 3 bloodstream infections were noted in 1000 catheter days. An incidence of 12% of mechanical complications and of 42% deep venous thromboses were observed. Of the latter none was associated with confirmed pulmonary embolism.

CONCLUSION: Femoral AC-CVC appeared to be deployed more often in critically ill patients, presenting with shock and/or traumatic brain injury in particular. The observed rate of complications in this sample seems to be low compared to reported rates.

VENTILACIÓ

1. **Resuscitation.** 2018 Mar 28. pii: S0300-9572(18)30145-X. doi: 10.1016/j.resuscitation.2018.03.035. [Epub ahead of print]

Chest compressions during ventilation in out-of-hospital cardiac arrest cause reversed airflow.

Duchatelet C1, Kalmar AF2, Monsieurs KG3, Hachimi-Idrissi S4.

Abstract

AIM: During cardiopulmonary resuscitation, once the patient is intubated, compressions and ventilations are performed simultaneously. Chest compressions during the inspiratory phase of ventilation may force air out of the lungs, causing so-called "reversed airflow", which may lead to ineffective ventilation. The purpose of this study is to determine the occurrence of this phenomenon and to quantify the volume of reversed airflow.

METHODS: Observational study. During manual ventilation of intubated patients receiving chest compressions, the pressure gradient over the endotracheal tube was measured using two air-filled catheters connected to a custom-made portable device. Chest compression data were measured using an accelerometer on a Zoll E-series defibrillator. All data are reported as mean (standard deviation; range).

RESULTS: Twenty-five patients and a total of 368 ventilations were studied, on average 15 (6; 10-30) per patient. The mean tidal volume, minute volume and ventilation rate were respectively 690 ml (160; 240-1260), 10.5 L/min (4.8; 4.4-22.1) and 18/min (6; 6-35). Reversed airflow was observed in 21/25 patients (84%) and in 65% of all ventilations, with on average two episodes per ventilation. Fifty-five percent of the chest compressions during the inspiratory phase of the ventilation generated reversed airflow. The mean volume of the reversed airflow was 96 ml per episode (52; 12-364).

CONCLUSION: Chest compressions during ventilation in intubated patients generated reversed airflow in most patients. There was wide variation in the number of episodes and volume of the reversed airflow between patients. The effect of this phenomenon on the efficacy of ventilation during resuscitation and on outcome needs further investigation.

ORGANITZACIÓ I ENTRENAMENT

1. **Nurse Educ Today.** 2018 Mar 24;65:232-238. doi: 10.1016/j.nedt.2018.03.008. [Epub ahead of print]

Basic life support and external defibrillation competences after instruction and at 6 months comparing face-to-face and blended training. Randomised trial.

Castillo J1, Gallart A2, Rodríguez E3, Castillo J4, Gomar C5.

Abstract

AIM OF THE STUDY: The objective of this study was to compare the immediate and 6-month efficacy of basic life support (BLS) and automatic external defibrillation (AED) training using standard or blended methods.

METHODS: First-year students of medicine and nursing (n = 129) were randomly assigned to a control group (face-to-face training based on the European Resuscitation Council [ERC] Guidelines) or to an experimental group that trained with a self-training video, a new website, a Moodle platform, an intelligent manikin, and 45 min of instructor presence. Both groups were homogeneous and were evaluated identically. Theoretical knowledge was evaluated using a multi-choice questionnaire (MCQ). Skill performance was evaluated by the instructor's rubric and on a high-fidelity Resusci Anne Q CPR manikin.

RESULTS: Immediately after the course, there were no statistically significant differences in knowledge between the two groups. The median score of practical evaluation assessed by the instructor was significantly better in the experimental group (8.15, SD 0.93 vs 7.7, SD 1.18; P = 0.02). No differences between groups were found when using a high-fidelity manikin to evaluate chest compressions and lung inflations. At six months, the scores in knowledge and skill performance were significantly lower compared to the evaluations at the end of the instruction, but they remained still higher compared to baseline. The experimental group had higher scores in practical skills evaluated by the instructor than the control group (7.44, SD 1.85 vs 6.10, SD 2.6; P = 0.01).

CONCLUSIONS: The blended method provides the same or even higher levels of knowledge and skills than standard instruction both immediately after the course and six months later.

CURES POST RCE

1. PLoS One. 2018 Apr 5;13(4):e0195628. doi: 10.1371/journal.pone.0195628. eCollection 2018. Serial evaluation of SOFA and APACHE II scores to predict neurologic outcomes of out-of-hospital cardiac arrest survivors with targeted temperature management.

Yoon JC1, Kim YJ2, Lee YJ3, Ryoo SM2, Sohn CH2, Seo DW2, Lee YS2, Lee JH2, Lim KS2, Kim WY2.

Abstract

OBJECTIVE: This study was aimed at a serial evaluation and comparison of the prognostic values of Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation (APACHE) II scores for neurologic outcomes in comatose, out-of-hospital cardiac arrest (OHCA) survivors, treated with targeted temperature management (TTM).

METHODS: We analysed a prospective cohort of comatose OHCA patients, with TTM, admitted to an emergency intensive care unit (ICU), between January 2010 and December 2015. SOFA and APACHE II scores were calculated initially, and then at day 1, 2, 3, 5, and 7 after ICU admission. Primary and secondary outcomes were the 28-day neurologic outcome and the 28-day mortality, respectively. Prognostic value of the SOFA and APACHE II scores was analysed using the receiver operating characteristic curve.

RESULTS: Of the 143 selected patients, 62 survived and 34 had good neurologic outcomes at day 28. There was no significant difference in the SOFA and extracerebral SOFA scores between the good and poor neurologic outcome groups. However, the APACHE II scores were significantly higher in the good outcome group; they displayed good discriminatory power in predicting poor outcomes, unlike the SOFA scores. The APACHE II score at day 3 had the highest prognostic value for predicting poor neurologic outcomes with an area under the curve of 0.793, and with a cut-off value of 20, the APACHE II score predicted poor neurologic outcomes with a sensitivity of 43.75%, a specificity of 94.12%, a positive predictive value of 94.59%, and a negative predictive value of 41.56%.

CONCLUSIONS: Identifying APACHE II score might assist as one piece of multimodal prognostic approach for the assessment of neurologic outcomes in OHCA survivors treated with TTM.

2. Shock. 2018 Mar 30. doi: 10.1097/SHK.0000000000001145. [Epub ahead of print]

Early Lactate Values After Out-of-Hospital Cardiac Arrest: Associations with One-Year Outcome.

Laurikkala J1, Skrifvars MB1, Bäcklund M1, Tiainen M2, Bendel S3, Karhu J4, Varpula T1, Vaahersalo J1, Pettilä V1, Wilkman E1; FINNRESUSCI study group.

Abstract

BACKGROUND: Previous studies have shown associations between high admission serum lactate, lower lactate clearance and increased short-term mortality after out-hospital cardiac arrest (OHCA). We studied whether lactate levels predict long-term outcome after OHCA.

METHODS: We included 458 OHCA patients with lactate measurements during intensive care unit (ICU) stay from the prospective FINNRESUSCI study. We evaluated thresholds for time-weighted (TW) mean lactate values for the first 24, 48 and 72 hours. We analyzed lactate clearance and used multivariate regression to assess the prognostic value of the different measurement time points.

RESULTS: The admission lactate (median [IQR] 3.06 [2.68-3.44] mmol/l vs 4.76 [4.29-5.23] mmol/l) and the last measured lactate (0.98 [0.90-1.06] mmol/l vs 2.40 [2.03-2.78] mmol/l) were higher in non-survivors than in survivors, as were the lowest (0.73 [0.67-0.79] mmol/l vs 1.83 [1.52-2.14] mmol/l) and the highest (3.44 [3.05-3.83] mmol/l vs 5.25 [4.76-5.74] mmol/l) lactate values (all $p < 0.001$). Time-weighted mean lactate values for the first 24 h, 48 h, 72 h and for the entire ICU stay were lower in patients with good outcome ($p < 0.001$). In multivariate backward regression models, time-weighted mean lactate for the entire ICU stay (OR 1.41 per mmol/l, CI 95% 1.08-1.86, $p = 0.013$) and the last measured lactate in the ICU (OR 2.16 per mmol/l, CI 95% 1.47-3.18, $p < 0.001$) were independent predictors of poor one-year outcome.

CONCLUSIONS: In the present study time-weighted mean lactate values for the entire ICU stay, and the last measured lactate value in the ICU, but not admission lactate or lactate clearance were independent predictors of poor one-year outcome.

3. Neurohospitalist. 2018 Apr;8(2):66-73. doi: 10.1177/1941874417733217. Epub 2017 Oct 29. **Prognostic Value of the Neurological Examination in Cardiac Arrest Patients After Therapeutic Hypothermia.**

Matthews EA1, Magid-Bernstein J1, Sobczak E1, Velazquez A 1, Falo CM1, Park S1, Claassen J1, Agarwal S1.

Abstract

Objectives: Current prognostication guidelines for cardiac arrest (CA) survivors predate the use of therapeutic hypothermia (TH). The prognostic value and ideal timing of the neurological examination remain unknown in the setting of TH.

Design: Patients (N = 291) admitted between 2007 and 2015 to Columbia University intensive care units for TH following CA had neurological examinations performed on days 1, 3, 5, and 7 postarrest. Absent pupillary light response (PLR), absent corneal reflexes (CRs), and Glasgow coma scores motor (GCS-M) no better than extension were considered poor examinations. Poor outcome was recorded as cerebral performance category score ≥ 3 at discharge and 1 year. Predictive values of examination maneuvers were calculated for each time point.

Main Results: Among the 137 survivors to day 7, sensitivities and negative predictive values were low at all time points. The PLR had false positive rates (FPRs) of 0% and positive predictive values (PPV) of 100% from day 3 onward. For the CR and GCS-M, the FPRs decreased from day 3 to 5 (9% vs 3%; 21% vs 9%), while PPVs increased (91% vs 96%; 90% vs 95%). Excluding patients who died due to withdrawal of life-sustaining therapy (WLST) did not significantly affect FPRs or PPVs, nor did assessing outcome at 1 year.

Conclusions: A poor neurological examination remains a strong predictor of poor outcome, both at hospital discharge and at 1 year, independent of WLST. Following TH, the predictive value of the examination is insufficient at day 3 and should be delayed until at least day 5, with some additional benefit beyond day 5.

TARGET TEMPERATURE MANAGEMENT

1. **Cardiol J.** 2017;24(3):324-333. doi: 10.5603/CJ.a2017.0016. Epub 2017 Feb 2.

A review of the utility of a hypothermia protocol in cardiac arrests due to non-shockable rhythms.

Freund B1, Kaplan PW.

Abstract

BACKGROUND: Therapeutic hypothermia and targeted temperature management are considered standard of care in the management of patients following out-of-hospital cardiac arrests due to shockable rhythms to improve neurological outcomes. In those presenting out-of-hospital cardiac arrests associated with non-shockable rhythms, the benefit of hypothermia is less clear. In this review we try to clarify the utility of implementing a hypothermia protocol after cardiac arrests due to non-shockable rhythms.

METHODS: PUBMED, Ovid, MEDLINE, EMBASE, and clinicaltrials.gov websites were searched through during October, 2016 using the terms "non shockable", "hypothermia," and "cardiac arrest." Studies were excluded if they solely evaluated in-hospital cardiac arrests, shockable rhythms, and/or pediatric patients. Data was extracted by two authors.

RESULTS: Forty studies were included in this review, most of which were not randomized or controlled, nor were they powered to make significant conclusions about the efficacy of hypothermia in this population. Some did evaluate specific factors that may portend to a better outcome in patients presenting with out-of-hospital cardiac arrest due to non-shockable rhythms undergoing hypothermia. Shortcomings included incorporating in-hospital cardiac arrest patients in analyses, comparing results of hypothermia in shockable versus non-shockable rhythm patients as an outcome measure, lacking standardization in cooling protocols, and short-term measures of outcomes.

CONCLUSIONS: It was concluded that further study is needed to characterize patients presenting nonshockable rhythms who would benefit from hypothermia to better guide its use in this population given the costs and implications of treatment and long-term care in those who survive with poor outcomes.

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ELECTROFISIOLOGIA I DESFIBRIL·LACIÓ

1. **Resuscitation.** 2018 Apr 2. pii: S0300-9572(18)30159-X. doi: 10.1016/j.resuscitation.2018.03.039. [Epub ahead of print] ECG changes during resuscitation of patients with initial pulseless electrical activity are associated with return of spontaneous circulation.

Skjeflo GW1, Nordseth T2, Loennechen JP3, Bergum D2, Skogvoll E2.

Abstract

BACKGROUND: Pulseless electrical activity (PEA) is a frequent initial rhythm in cardiac arrest, and ECG characteristics have been linked to prognosis. The aim of this study was to examine the development of ECG characteristics during advanced life support (ALS) and cardiopulmonary resuscitation (CPR) in initial PEA, and to assess any association with survival.

METHODS: Patients with in-hospital cardiac arrest with initial PEA at St. Olav Hospital (Trondheim, Norway) over a three-year period were included. A total of 2187 combined observations of QRS complex rate (heart rate) and QRS complex width for the duration of ALS were determined from defibrillator recordings from 74 episodes of cardiac arrest.

RESULTS: Increasing heart rate and decreasing QRS complex width during ALS was significantly more prevalent in patients who obtained return of spontaneous circulation compared to patients who were declared dead.

CONCLUSION: Changes in ECG characteristics during ALS in cardiac arrest presenting as PEA are related to prognosis. An increase in heart rate was observed in the last 3-6 min before ROSC was obtained.

ECMO

1. **J Cardiovasc Surg (Torino).** 2018 Apr 3. doi: 10.23736/S0021-9509.18.10283-7. [Epub ahead of print]

Further options and survival results after failure following ECLS implantation.

Rupprecht L1, Camboni D1, Philipp A1, Lunz D1, Müller T1, Schmid C2, Keyser A1.

Abstract

BACKGROUND: A retrospective study was designed to analyze the outcome of patients with extracorporeal life support (ECLS) who needed a consecutive cardiac or pulmonary support system.

METHODS: From 2006 to 2016, 93 out of 587 patients with their age ranging from 2.4 to 77.3 years required an exchange of an ECLS by another mechanical support system. Sixty-one patients were in-hospital cases, 39 patients were referred with ECLS from other institutions by ambulance car (n=15) or helicopter (n=24). Sixty-five patients came from internal medicine wards, of which 38 patients had CPR, whereas 24 patients suffered post-cardiotomy failure with CPR in 11 cases. Ten patients were referred from other hospitals for failure to wean from ECLS. **RESULTS:** Leading symptoms were continuing cardiac failure in 43 patients (46%) and ongoing respiratory failure after cardiac recovery in 50 patients (54%). Patients with cardiac failure underwent implantation of a ventricular assist device (n=36) or remained on long-term ECLS (n=7) until a donor organ for heart transplantation was available (mean waiting time 43 days). Respiratory failure was treated by veno-venous ECMO (n=34) or vav-ECMO (n=16). Overall in-house survival was 50.5 % (n=47). Only 22.6 % of patients (n=21) died during ongoing support. In contrast, 26.9 % of patients (n=25) deceased 35+/-51 days after weaning from vv- or vav-ECMO. Major reasons of death were multi-organ failure in 16 patients, cerebral hypoxia in 12 patients, sepsis in 10 patients, and intractable low output in 5 patients. **CONCLUSIONS:** Despite a switch from ECLS to another mechanical support system, survival remains limited as irreversible multi-organ failure and sepsis still jeopardize the patients' life.

PEDIATRIA

1. **Eur J Pediatr.** 2017 Jul;176(7):865-871. doi: 10.1007/s00431-017-2922-z. Epub 2017 May 12. **Comparison of four different intraosseous access devices during simulated pediatric resuscitation. A randomized crossover manikin trial.**

Bielski K1, Szarpak L2, Smereka J3, Ladny JR 4, Leung S5, Ruetzler K5,6.

Abstract

The aim of the study was to compare the success rate, procedure time, and user satisfaction of pediatric NIO™ compared to Pediatric BIG®, EZ-IO®, and Jamshidi intraosseous access devices. This was a randomized, crossover manikin trial with 87 paramedics. The correct location of intraosseous access when using NIO, BIG, EZ-IO, and Jamshidi was varied and was respectively 100, 90, 90, and 90%. The time required to obtain intravascular access (time T1) in the case of NIO, BIG, EZ-IO, and Jamshidi was varied and amounted to 9 s [IQR, 8-12] for NIO, 12 s [IQR, 9-16] for BIG, 13.5 s [IQR, 11-17] for the EZ-IO, and 15 s [IQR, 13-19] for Jamshidi. The paramedics evaluated each device on the subjective ease with which they performed the procedures. The intraosseous device, which proved the easiest to use was NIO, which in the case of CPR received a median rating of 1.5 (IQR, 0.5-1.5) points.

CONCLUSION: Our study found that NIO® is superior to BIG®, EZ-IO®, and Jamshidi. NIO® achieved the highest first attempt success rate. NIO® also required the least time to insert and easiest to operate even by novice users. Further study is needed to test our findings in cadavers or human subjects. Based on our findings, NIO® is a promising intraosseous device for use in pediatric resuscitation. **What is Known:** • Venous access in acutely ill pediatric patients, such as those undergoing cardiopulmonary resuscitation, is needed for prompt administration of drugs and fluids. • Intraosseous access is recommended by American Heart Association and European Resuscitation Council if vascular access is not readily obtainable to prevent delay in treatment. **What is New:** • This simulated pediatric resuscitation compared performance of four commercially available pediatric intraosseous devices in a manikin model. • NIO® outperformed BIG®, EZ-IO®, and Jamshidi in first attempt success rates and time of procedure among novice users.

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2. **Trials.** 2018 Apr 3;19(1):213. doi: 10.1186/s13063-018-2590-y.

Improving outcomes after pediatric cardiac arrest - the ICU-Resuscitation Project: study protocol for a randomized controlled trial.

Reeder RW1, Girling A2, Wolfe H3, Holubkov R4, Berg RA3, Naim MY3, Meert KL5, Tilford B5, Carcillo JA6, Hamilton M6, Bochkoris M6, Hall M7, Maa T7, Yates AR7, Sapru A8, Kelly R8, Federman M8, Michael Dean J4, McQuillen PS9, Franzon D9, Pollack MM10, Siems A10, Diddle J10, Wessel DL11, Mourani PM12, Zebuhr C12, Bishop R12, Friess S13, Burns C13, Viteri S14, Hehir DA14, Whitney Coleman R4, Jenkins TL15, Notterman DA16, Tamburro RF15, Sutton RM3;

Eunice Kennedy Shriver National Institute of Child Health and Human Development Collaborative Pediatric Critical Care Research Network (CPCCRN).

Abstract

BACKGROUND: Quality of cardiopulmonary resuscitation (CPR) is associated with survival, but recommended guidelines are often not met, and less than half the children with an in-hospital arrest will survive to discharge. A single-center before-and-after study demonstrated that outcomes may be improved with a novel training program in which all pediatric intensive care unit staff are encouraged to participate in frequent CPR refresher training and regular, structured resuscitation debriefings focused on patient-centric physiology.

METHODS/DESIGN: This ongoing trial will assess whether a program of structured debriefings and point-of-care bedside practice that emphasizes physiologic resuscitation targets improves the rate of survival to hospital discharge with favorable neurologic outcome in children receiving CPR in the intensive care unit. This study is designed as a hybrid stepped-wedge trial in which two of ten participating hospitals are randomly assigned to enroll in the intervention group and two are assigned to enroll in the control group for the duration of the trial. The remaining six hospitals enroll initially in the control group but will transition to enrolling in the intervention group at randomly assigned staggered times during the enrollment period.

DISCUSSION: To our knowledge, this is the first implementation of a hybrid stepped-wedge design. It was chosen over a traditional stepped-wedge design because the resulting improvement in statistical power reduces the required enrollment by 9 months (14%). However, this design comes with additional challenges, including logistics of implementing an intervention prior to the start of enrollment. Nevertheless, if results from the single-center pilot are confirmed in this trial, it will have a profound effect on CPR training and quality improvement initiatives.

TRIAL REGISTRATION: ClinicalTrials.gov, NCT02837497 . Registered on July 19, 2016.

Free Article

3. **Resuscitation.** 2018 Mar 29. pii: S0300-9572(18)30143-6. doi: 10.1016/j.resuscitation.2018.03.033. [Epub ahead of print]

Variability in the time to initiation of CPR in continuously monitored pediatric ICUs.

Olson M1, Helfenbein E2, Su L2, Berg M2, Knight L2, Troy L2, Sacks L2, Sakai D2, Su F2.

Abstract

AIM: To study the influence of patient characteristics and unit ergonomics and human factors on the time to initiation of CPR.

METHODS: A single center study of children, 0 to 21 years old, admitted to an ICU who experienced cardiopulmonary arrest (CPA) requiring >1 minute of chest compressions. Time of CPA was determined by analysis of continuous ECG, plethysmography, arterial blood pressure, and end-tidal CO₂ (EtCO₂) waveforms. Initiation of CPR was identified by the onset of cyclic artifact in the ECG waveform. Patient characteristics and unit ergonomics and human factors were examined including CPA cause, identification on the High-Risk Checklist (HRC), existing monitoring, ICU type, time of day, nursing shift change, and outcome.

RESULTS: The median time from CPA to initiation of CPR was 50.5 s (IQR 26.5 to 127.5) in 36 CPAs. Forty-seven percent of patients experienced time from CPA to initiation of CPR of > 1 minute. There was no difference in CPA cause, ICU type, time of day, or nursing shift change.

CONCLUSION: Nearly half of pediatric patients who experienced CPA in an ICU setting did not meet AHA guidelines for early initiation of CPR. This is an opportunity to study the recognition phase of CPA using continuous monitoring data with the aim of improving the understanding of and factors contributing to delays in initiation of CPR.

RECERCA EXPERIMENTAL

1. **J Trauma Acute Care Surg.** 2018 Apr 2. doi: 10.1097/TA.0000000000001901. [Epub ahead of print]

Left Ventricular Compressions Improve Return of Spontaneous Circulation and Hemodynamics in a Swine Model of Traumatic Cardiopulmonary Arrest.

Anderson KL1, Fiala KC, Castaneda MG, Boudreau SM, Araña AA, Bebartha VS.

Abstract

BACKGROUND: Prehospital cardiopulmonary resuscitation, including closed chest compressions, has commonly been considered ineffective in traumatic cardiopulmonary arrest (TCPA) because traditional chest compressions do not produce substantial cardiac output. However, recent evidence suggests that chest compressions located over the left ventricle produce greater hemodynamics when compared to traditional compressions. We hypothesized that chest compressions located directly over the left ventricle would improve return of spontaneous circulation (ROSC) and hemodynamics, when compared to traditional chest compressions, in a swine model of traumatic cardiopulmonary arrest (TCPA).

METHODS: Transthoracic echocardiography was used to mark the location of the aortic root (traditional compressions), and the center of the left ventricle (LV) on animals (n=26) which were randomized to receive chest compressions in one of the two locations. After hemorrhage, ventricular fibrillation (VF) was induced. After ten minutes of VF, basic life support (BLS) with mechanical CPR was initiated and performed for ten minutes followed by advanced life support (ALS) for an additional ten minutes. During BLS the area of maximal compression was verified using transesophageal echocardiography. Hemodynamic variables were averaged over the final two minutes of BLS and ALS periods.

RESULTS: Five of the left ventricle group (38%) achieved ROSC compared to zero of the aortic root group (p=0.04). Additionally, there was an increase in aortic systolic blood pressure (SBP), aortic diastolic blood pressure (DBP) and coronary perfusion pressure (CPP) at the end of both the BLS (95% CI SBP -49 to -21, DBP -14 to -5.6 and CPP -15 to -7.4) and ALS (95% CI SBP -66 to -21, DBP -49 to -6.8 and CPP -51 to -7.5) resuscitation periods among the LV group.

CONCLUSIONS: In our swine model of TCPA, chest compressions performed directly over the left ventricle improved ROSC and hemodynamics when compared to traditional chest compressions.
LEVEL OF EVIDENCE: Therapeutic Animal Model, Level I.

CASE REPORTS

1. **Am J Emerg Med.** 2018 Jan 3. pii: S0735-6757(18)30007-X. doi: 10.1016/j.ajem.2018.01.007. [Epub ahead of print]

Out of hospital extracorporeal life support (ECLS) implantation in cardiogenic shock after cardiac arrest - A case report.

Schempf B1, Schibilsky D2, Gaier G3, Schadt B3, Haase KK4, Schlensak C2, Häske D5.

Abstract

We report the use of out-of-hospital extracorporeal life support (ECLS) in a 62-year-old patient with severe cardiogenic shock after cardiac arrest. The patient was successfully stabilized using the ECLS system in the pre-hospital setting. Hospital discharge with a good neurological outcome was possible after 23days.

2. **Toxicon.** 2018 Mar 30. pii: S0041-0101(18)30126-0. doi: 10.1016/j.toxicon.2018.03.014. [Epub ahead of print]

Cardiac arrest and atrial fibrillation in a patient after hump-nosed pit viper (*Hypnale hypnale*) bite.

Namal Rathnayaka RMMK1, Nishanthi Ranathunga PEA2, Ranaweera J3, Jayasekara K4, Kularatne SAM5.

Abstract

A 42-year-old previously healthy male patient died 16 days after a proven hump-nosed pit viper (*Hypnale hypnale*) envenoming due to multi-organ failure. On admission he had cardiac arrest that recovered from cardiopulmonary resuscitation then developed atrial fibrillation which was reverted to normal rhythm by application of synchronized electrical cardioversion. He also had persistent coagulopathy and thrombotic microangiopathy comprising the triad of microangiopathic haemolysis, acute kidney injury and thrombocytopenia. This is the second reported case with cardiac complications following hump-nosed pit viper bites in Sri Lanka.

RCP i COMPRESSORS TORÀCICS MECÀNICS

1. **J Emerg Trauma Shock.** 2018 Jan-Mar;11(1):31-37. doi: 10.4103/JETS.JETS_58_17.
Cardiopulmonary Resuscitation: Unusual Techniques for Unusual Situations.

Bhatnagar V1, Jinjil K1, Dwivedi D1, Verma R2, Tandon U1.

Abstract

Background: The cardiopulmonary resuscitation (CPR) in prone position has been dealt with in 2010 American Heart Association (AHA) guidelines but have not been reviewed in 2015 guidelines. The guidelines for patients presenting with cardiac arrest under general anesthesia in lateral decubitus position and regarding resuscitation in confined spaces like airplanes are also not available in AHA guidelines. This article is an attempt to highlight the techniques adopted for resuscitation in these unusual situations.

Aims: This study aims to find out the methodology and efficacy in nonconventional CPR approaches such as CPR in prone, CPR in lateral position, and CPR in confined spaces.

Methods: We conducted a literature search using MeSH search strings such as CPR + Prone position, CPR + lateral Position, and CPR + confined spaces.

Results: No randomized controlled trials are available. The literature search gives a handful of case reports, some simulation- and manikin-based studies but none can qualify for class I evidence. The successful outcome of CPR performed in prone position has shown compressions delivered on the thoracic spine with the same rate and force as they were delivered during supine position. A hard surface is required under the patient to provide uniform force and sternal counter pressure. Two rescuer technique for providing successful chest compression in lateral position has been documented in the few case reports published. Over the head CPR and straddle (STR), CPR has been utilized for CPR in confined spaces. Ventilation in operating rooms was taken care by an advanced airway in situ.

Conclusion: A large number of studies of high quality are required to be conducted to determine the efficacy of CPR in such positions.

Free Article

2. **J R Army Med Corps.** 2018 Apr 6. pii: jramc-2018-000908. doi: 10.1136/jramc-2018-000908. [Epub ahead of print]

Military application of mechanical CPR devices: a pressing requirement?

Parsons IT1, Cox AT1, Rees PSC1,2.

Abstract

Maintaining high-quality chest compressions during cardiopulmonary resuscitation following cardiac arrest presents a challenge. The currently available mechanical CPR (mCPR) devices are described in this review, coupled with an analysis of the evidence pertaining to their efficacy. Overall, mCPR appears to be at least equivalent to high-quality manual CPR in large trials. There is potential utility for mCPR devices in the military context to ensure uninterrupted quality CPR following a medical cardiac arrest. Particular utility may be in a prohibitive operational environment, where manpower is limited or where timelines to definitive care are stretched resulting in a requirement for prolonged resuscitation. mCPR can also act as a bridge to advanced endovascular resuscitation techniques should they become more mainstream therapy.

REGISTRES, REVISIONS I EDITORIALS

1. **Curr Opin Crit Care.** 2018 Apr 6. doi: 10.1097/MCC.0000000000000499. [Epub ahead of print]
Physiology-directed cardiopulmonary resuscitation: advances in precision monitoring during cardiac arrest.

Marquez AM1, Morgan RW1, Ross CE2, Berg RA1, Sutton RM1.

Abstract

PURPOSE OF REVIEW: We review the recent advances in physiologic monitoring during cardiac arrest and offer an evidence-based framework for prioritizing physiologic targets during cardiopulmonary resuscitation (CPR).

RECENT FINDINGS: Current CPR guidelines recommend a uniform approach for all patients in cardiac arrest, but newer data support a precision strategy that uses the individual patient's physiology to guide resuscitation. Coronary perfusion pressure and arterial DBP are associated with survival outcomes in recent animal and human studies. End-tidal carbon dioxide is a reasonable noninvasive alternative, but may be inferior to invasive hemodynamic endpoints. Cerebral oximetry and cardiac ultrasound are emerging physiologic indicators of CPR effectiveness.

SUMMARY: Physiologic monitoring can and should be used to deliver precision CPR whenever possible and may improve outcomes after cardiac arrest.

2. **Resuscitation.** 2018 Apr 6. pii: S0300-9572(18)30165-5. doi: 10.1016/j.resuscitation.2018.04.004. [Epub ahead of print]

Out-of-hospital Cardiac Arrest with Do-Not-Resuscitate Orders Signed in Hospital: Who are the Survivors?

Zhang W1, Liao J1, Liu Z1, Weng R2, Ye X2, Zhang Y1, Xu J1, Wei H3, Xiong Y4, Idris A5.

Abstract

BACKGROUND: Signing Do-Not-Resuscitate orders is an important element contributing to a worse prognosis for out-of-hospital cardiac arrest (OHCA). However, our data showed that some of those OHCA patients with Do-Not-Resuscitate orders signed in hospital survived to hospital discharge, and even recovered with favorable neurological function. In this study, we described their clinical features and identified those factors that were associated with better outcomes.

METHODS: A retrospective, observational analysis was performed on all adult non-traumatic OHCA who were enrolled in the Resuscitation OUTCOMES: Consortium (ROC) PRIMED study but signed Do-Not-Resuscitate orders in hospital after admission. We reported their demographics, characteristics, interventions and outcomes of all enrolled cases. Patients surviving and not surviving to hospital discharge, as well as those who did and did not obtain favorable neurological recovery, were compared. Logistic regression models assessed those factors which might be prognostic to survival and favorable neurological outcomes at discharge.

RESULTS: Of 2289 admitted patients with Do-Not-Resuscitate order signed in hospital, 132(5.8%) survived to hospital discharge and 28(1.2%) achieved favorable neurological recovery. Those factors, including witnessed arrest, prehospital shock delivered, Return of Spontaneous Circulation (ROSC) obtained in the field, cardiovascular interventions or procedures applied, and no prehospital adrenaline administered, were independently associated with better outcomes.

CONCLUSIONS: We suggest that some factors should be taken into considerations before Do-Not-Resuscitate decisions are made in hospital for those admitted OHCA patients.

3. **Am J Cardiol.** 2018 Mar 14. pii: S0002-9149(18)30274-1. doi: 10.1016/j.amjcard.2018.02.038. [Epub ahead of print]

Out-of-Hospital Cardiac Arrests During the Japanese Professional Baseball Championship Series.

Onozuka D1, Hagihara A2.

Abstract

Because the Japan Professional Baseball Championship Series (Japan Series) is a stressful sports event, it is possible that watching Japan Series matches may increase the risk of cardiovascular events. Therefore, we investigated the potential association between the Japan Series and the incidence of out-of-hospital cardiac arrest (OHCA) events. National registry data for all cases of OHCA between 2005 and 2014 from 47 prefectures of Japan were obtained. We used a time-stratified case-crossover design with a conditional Poisson regression model to compare OHCA events during the Japan Series with those events that occurred during the periods except for dates of the Japan Series. The estimated associations for each prefecture were pooled at the nationwide level using a random-effects meta-analysis. In total, 666,020 OHCA of presumed cardiac origin were reported during the study period. On days of Japan Series matches, the pooled relative risk of OHCA was 1.033 (95% confidence interval 1.012 to 1.055; $p = 0.002$; $I^2 = 3.5\%$, P for heterogeneity = 0.405). Stratified analyses by gender revealed that the substantial increase in OHCA during the events was observed for men, whereas we found no significant increase for women. We also found a considerable rise in OHCA among patients aged ≥ 65 years; however, there was no significant evidence of increased risk in those aged 18 to 64 years. In conclusion, stressful baseball match is associated with an increased risk of OHCA. Prevention measures for severe emotional stress-related OHCA should be implemented, particularly for elderly men

FÀRMACS

1. **Crit Care Med.** 2018 May;46(5):e443-e451. doi: 10.1097/CCM.0000000000003049.

Vasopressors During Cardiopulmonary Resuscitation. A Network Meta-Analysis of Randomized Trials.

Belletti A1, Benedetto U2, Putzu A3, Martino EA1, Biondi-Zoccai G4,5, Angelini GD2, Zangrillo A1,6, Landoni G1,6.

Abstract

OBJECTIVES: Several randomized controlled trials have compared adrenaline (epinephrine) with alternative therapies in patients with cardiac arrest with conflicting results. Recent observational studies suggest that adrenaline might increase return of spontaneous circulation but worsen neurologic outcome. We systematically compared all the vasopressors tested in randomized controlled trials in adult cardiac arrest patients in order to identify the treatment associated with the highest rate of return of spontaneous circulation, survival, and good neurologic outcome.

DESIGN: Network meta-analysis.

PATIENTS: Adult patients undergoing cardiopulmonary resuscitation.

INTERVENTIONS: PubMed, Embase, BioMed Central, and the Cochrane Central register were searched (up to April 1, 2017). We included all the randomized controlled trials comparing a vasopressor with any other therapy. A network meta-analysis with a frequentist approach was performed to identify the treatment associated with the highest likelihood of survival.

MEASUREMENTS AND MAIN RESULTS: Twenty-eight studies randomizing 14,848 patients in 12 treatment groups were included. Only a combined treatment with adrenaline, vasopressin, and methylprednisolone was associated with increased likelihood of return of spontaneous circulation and survival with a good neurologic outcome compared with several other comparators, including adrenaline. Adrenaline alone was not associated with any significant difference in mortality and good neurologic outcome compared with any other comparator.

CONCLUSIONS: In randomized controlled trials assessing vasopressors in adults with cardiac arrest, only a combination of adrenaline, vasopressin, and methylprednisolone was associated with improved survival with a good neurologic outcome compared with any other drug or placebo, particularly in in-hospital cardiac arrest. There was no significant randomized evidence to support neither discourage the use of adrenaline during cardiac arrest.

ORGANITZACIÓ I ENTRENAMENT

1. **Acta Biomed.** 2018 Feb 23;89(4-5):37-44. doi: 10.23750/abm.v89i4-S.7129.

A randomized comparison trial of two and four-step approaches to teaching Cardio-Pulmonary Reanimation.

Lapucci G1, Bondi B2, Rubbi I3, Cremonini V4, Moretti E5, Di Lorenzo R6, Magnani D7, Ferri P7.

Abstract

BACKGROUND AND AIM OF THE WORK: The treatment of cardiac arrest in an extra-hospital environment improves with the increase in the number of people able to establish an early Cardio-Pulmonary Reanimation (CPR). The main aim of the study was to assess the validity of the two-step method in case of prolonged CPR.

METHODS: A randomized comparison study was conducted in the University Nursing School of a Northern Italian town, during the 2015/16 academic year, among 60 students, to teach them CPR techniques, through two different teaching methods (4-step and the 2-step of CPR training). The effectiveness of the maneuvers performed on mannequins equipped with skill-meter was verified.

RESULTS: Our study did not highlight any significant difference between the two methods of CPR training. The comparison between the two methods regarding their efficacy in practical teaching of CPR, highlighted by this study, proved the validity of both the 4-minute continuous method (1st method) and the 30:2 method (2nd method).

CONCLUSIONS: The results of the study showed no differences between the 2-step and the 4-step methods, in the effectiveness of cardiac massage. The correct execution of chest compressions during a CPR is the key to increase the patient's chances of rescue. Research has shown that any interruption in the execution of chest compressions, leads to a progressive reduction of the effectiveness of cardiac massage, with negative consequences on the prognosis of the patient undergoing at CPR.

CURES POST RCE

1. **Resuscitation.** 2018 Apr 10. pii: S0300-9572(18)30169-2. doi: 10.1016/j.resuscitation.2018.04.008. [Epub ahead of print]

Association between intra- and post-arrest hyperoxia on mortality in adults with cardiac arrest: a systematic review and meta-analysis.

Patel JK1, Kataya A2, Parikh PB3.

Abstract

OBJECTIVES: The association between intra-arrest and post-arrest hyperoxia and mortality in adults with cardiac arrest (CA) is widely debated. We therefore conducted a systematic review and meta-analysis to investigate the association between intra-arrest and post-arrest hyperoxia and mortality in adults with CA.

METHODS: We systematically searched MEDLINE and Cochrane databases to identify observational studies from January 2008 to December 2017 investigating the relationship between hyperoxia (either intra-arrest or post-arrest) and mortality in adults with CA.

RESULTS: We included 16 observational studies with a total of 40,573 adult patients. Six studies included patients only with out-of-hospital CA (OHCA), 2 studies included patients only with in-hospital CA (IHCA), and 8 studies included patients with both OHCA and IHCA. Two studies assessed intra-arrest hyperoxia while 14 studies examined post-arrest hyperoxia. Of the 10 studies included for quantitative analysis, intra-arrest hyperoxia was associated with a significantly lower mortality rate [odds ratio (OR) 0.25, 95% confidence interval (CI) 0.12-0.53, $p < 0.001$] while post-arrest hyperoxia was associated with higher mortality (OR 1.34, 95%CI 1.08-1.67, $p = 0.008$).

CONCLUSIONS: In adults with CA, intra-arrest hyperoxia is associated with lower mortality while post-arrest hyperoxia is associated with higher mortality.

2. **Resuscitation.** 2018 Apr 4. pii: S0300-9572(18)30160-6. doi: 10.1016/j.resuscitation.2018.04.001. [Epub ahead of print]

Preliminary observations in systemic oxygen consumption during targeted temperature management after cardiac arrest.

Uber A1, Grossestreuer AV2, Ross CE3, Patel Rn PV2, Trehan A2, Donnino MW4, Berg KM5.

Abstract

AIM: Limited data suggests low oxygen consumption (VO₂), driven by mitochondrial injury, is associated with mortality after cardiac arrest. Due to the challenges of measurement in the critically ill, post-arrest metabolism remains poorly characterized. We monitored VO₂, carbon dioxide production (VCO₂) and the respiratory quotient (RQ) in post-arrest patients and explored associations with outcome.

METHODS: Using a gas exchange monitor, we measured continuous VO₂ and VCO₂ in post-arrest patients treated with targeted temperature management. We used area under the curve and medians over time to evaluate the association between VO₂, VCO₂, RQ and the VO₂:lactate ratio with survival.

RESULTS: In 17 patients, VO₂ in the first 12 hours after return of spontaneous circulation (ROSC) was associated with survival (median in survivors 3.35 mL/kg/min [2.98,3.88] vs. non-survivors 2.61 mL/kg/min [2.21,2.94], $p = 0.039$). This did not persist over 24 hours. The VO₂:lactate ratio was associated with survival (median in survivors 1.4 [IQR: 1.1,1.7] vs. non-survivors 0.8 [IQR: 0.6,1.2] $p < 0.001$). Median RQ was 0.66 (IQR 0.63,0.70) and 71% of RQ measurements were < 0.7 . Patients with initial RQ < 0.7 had 17% survival versus 64% with initial RQ > 0.7 ($p = 0.131$). VCO₂ was not associated with survival.

CONCLUSIONS: There was a significant association between VO₂ and mortality in the first 12 hours after ROSC, but not over 24 hours. Lower VO₂: lactate ratio was associated with mortality. A large percentage of patients had RQs below physiologic norms. Further research is needed to explore whether these parameters could have true prognostic value or be a potential treatment target.

TARGET TEMPERATURE MANAGEMENT

1. **Mil Med.** 2018 Mar 1;183(suppl_1):162-168. doi: 10.1093/milmed/usx207.

Retrospective Analysis of Esophageal Heat Transfer for Active Temperature Management in Post-cardiac Arrest, Refractory Fever, and Burn Patients.

Naiman M1, Markota A2, Hegazy A3, Dingley J4, Kulstad E5.

Abstract

Core temperature management is an important aspect of critical care; preventing unintentional hypothermia, reducing fever, and inducing therapeutic hypothermia when appropriate are each tied to positive health outcomes. The purpose of this study is to evaluate the performance of a new temperature management device that uses the esophageal environment to conduct heat transfer. De-identified patient data were aggregated from three clinical sites where an esophageal heat transfer device (EHTD) was used to provide temperature management. The device was evaluated against temperature management guidelines and best practice recommendations, including performance during induction, maintenance, and cessation of therapy. Across all active cooling protocols, the average time-to-target was 2.37 h and the average maintenance phase was 22.4 h. Patients spent 94.9% of the maintenance phase within $\pm 1.0^{\circ}\text{C}$ and 67.2% within $\pm 0.5^{\circ}\text{C}$ (574 and 407 measurements, respectively, out of 605 total). For warming protocols, all of the patient temperature readings remained above 36°C throughout the surgical procedure (average 4.66 h). The esophageal heat transfer device met performance expectations across a range of temperature management applications in intensive care and burn units. Patients met and maintained temperature goals without any reported adverse events.

ELECTROFISIOLOGIA I DESFIBRIL·LACIÓ

1. **Resuscitation.** 2018 Apr 6. pii: S0300-9572(18)30157-6. doi: 10.1016/j.resuscitation.2018.03.037. [Epub ahead of print]

Association of race and socioeconomic status with automatic external defibrillator training prevalence in the United States.

Owen DD1, McGovern SK1, Murray A1, Leary M1, Del Rios M2, Merchant RM1, Abella BS1, Dutwin D3, Blewer AL4.

Abstract

AIM OF THE STUDY: Automated external defibrillators (AEDs) improve survival from out-of-hospital cardiac arrest (OHCA), however bystander use remains low. Limited AED training may contribute to infrequent use of these devices, yet no studies have assessed AED training nationally. Given previously documented racial disparities among Latinos in CPR provision and OHCA outcomes, we hypothesized that racial and socioeconomic differences exist in AED training, with Whites having increased training compared to Latinos and higher socioeconomic status being associated with increased training.

METHODS: We administered a random digit dial survey to a nationally-representative adult sample. Using survey-weighted logistic regression adjusted for location, we assessed race and socioeconomic status of individuals trained in AEDs compared to never-trained individuals.

RESULTS: From 09/2015-11/2015, 9,022 individuals completed the survey. Of those, 68% had never been AED trained. Self-identified Whites and Blacks were more likely to have AED training compared to Latinos (OR: 1.90, 95% CI: 1.43-2.53 and OR: 1.73, 95% CI: 1.39-2.15, respectively). Higher educational attainment was associated with an increased likelihood of training, with an OR of 4.36 (95% CI: 2.57-7.40) for graduate school compared to less than high school education. Increased household income was not associated with an increase in AED training ($p = 0.08$).

CONCLUSIONS: The minority of respondents reported AED training. Whites and Blacks were more likely to be trained than Latinos. Higher educational attainment was associated with an increased likelihood of training. These findings highlight an important opportunity to improve training disparities and layperson response to OHCA.

ECMO

1. **A A Pract.** 2018 Feb 23. doi: 10.1213/XAA.0000000000000742. [Epub ahead of print]

Perioperative Extracorporeal Cardiopulmonary Resuscitation: The Defibrillator of the 21st Century?: A Case Report.

Charlesworth M1, Barker JM, Greenhalgh D, Ashworth AD.

Abstract

Veno-arterial-extracorporeal membrane oxygenation (ECMO) for cardiopulmonary resuscitation (ECMO-CPR) has been recommended by new resuscitation guidelines in the United Kingdom. Our recently established yet unfunded ECMO-CPR service has thus far treated 6

patients, with 3 making a good recovery. One patient suffered a catastrophic perioperative complication through glycine absorption and we are in no doubt that she would not have survived without ECMO. We argue for a pragmatic approach to funding of ECMO-CPR because observational evidence suggests superiority over traditional resuscitation and there exists major methodological and ethical barriers to randomized controlled studies. We also call for high-quality observational evidence in the perioperative setting.

2. **Resuscitation.** 2018 Apr 4. pii: S0300-9572(18)30155-2. doi: 10.1016/j.resuscitation.2018.03.036. [Epub ahead of print]

Health related quality of life after extracorporeal cardiopulmonary resuscitation in refractory cardiac arrest.

Spangenberg T1, Schewel J2, Dreher A2, Meincke F2, Bahlmann E2, van der Schalk H2, Kreidel F2, Frerker C2, Stoeck M3, Bein B 3, Kuck KH2, Ghanem A4.

Abstract

BACKGROUND: Recent data identifies extracorporeal cardio-pulmonary resuscitation (eCPR) as a potential addendum of conventional cardiopulmonary-resuscitation (cCPR) in highly specified circumstances and selected patients. However, consented criteria indicating eCPR are lacking. Therefore we provide first insights into the health-related quality of life (HRQoL) outcomes of patients treated with eCPR in a real world setting.

METHODS: Retrospective single-center experience of 60 consecutive patients treated with eCPR between 01/2014 and 06/2016 providing 1-year survival- and HRQoL data obtained through the Short-Form 36 Survey (SF-36) after refractory out-of-hospital- (OHCA) and in-hospital cardiac arrest (IHCA) of presumed cardiac etiology.

RESULTS: Resuscitation efforts until initiation of eCPR averaged 66 ± 35 minutes and 63.3% of the patients suffered from OHCA. Fifty-five (91.7%) of the overall events were witnessed and bystander-CPR was performed in 73.3% (n = 44) of cases. Cause of arrest was dominated by acute myocardial infarction (AMI, 66.7%) and initial rhythm slightly outbalanced by ventricular fibrillation/tachycardia (VF/VT 53.3%). 12-month survival was 31%. Survivors experienced more often bystander-CPR (p = 0.001) and a shorter duration of cCPR (p = 0.002). While mid-term survivors' perceived HRQoL was compromised compared to controls (p \leq 0.0001 for PF, RP, RE and BP; p = 0.007 for GH; p = 0.016 for SF; p = 0.030 for MH; p = 0.108 for VT), scores however resembled HRQoL of subjects on hemodialysis, following cardiogenic shock or pulmonary failure treated with extracorporeal membrane oxygenation (ECMO).

CONCLUSIONS: While HRQoL scores of our survivors ranged markedly below controls, compared to patients on chronic hemodialysis, following ECMO for cardiogenic shock or pulmonary failure most of the discrepancies ameliorated. Thus, successful eCPR in properly selected patients does translate into an encouraging HRQoL approximating chronic renal failure.

3. **Cureus.** 2018 Feb 6;10(2):e2161. doi: 10.7759/cureus.2161.

Trans-cranial Doppler as an Ancillary Study Supporting Irreversible Brain Injury in a Post Cardiac Arrest Patient on Extracorporeal Membrane Oxygenation.

Mullaguri N1, Sarwal A2, Katyal N3, Nattanamai P 3, George P1, Newey CR1.

Abstract

Obtaining neuroimaging in patients on cardiopulmonary support devices such as extracorporeal membrane oxygenation (ECMO) can be challenging, given the complexities in monitoring, instrumentation, and associated hemodynamic lability. Transcranial Doppler (TCD) is used as an ancillary test for the assessment of cerebral circulatory arrest, but its use in non-pulsatile blood flow in venoarterial (VA) ECMO is not well described. We report the use of TCD in a patient on VA ECMO post-cardiac arrest for evaluation of death by neurological criteria. A 72-year-old female was admitted for elective trans-catheter aortic valve replacement. Her postoperative course was complicated by hemo-pericardium evolving into pulseless electrical activity causing cardiac arrest. She was resuscitated with return of spontaneous circulation and initiated on VA ECMO and intra-aortic balloon pump for cardiogenic shock. Over the next few days, serial evaluations persistently showed a poor neurological examination. She was too unstable to transport for neuroimaging. Evaluation for death by neurological criteria was performed with a clinical examination, apnea testing, and TCD as an ancillary study. TCD showed systolic spikes supporting an impression of cerebral circulatory arrest consistent with an irreversible brain injury.

RECERCA EXPERIMENTAL

1. **Cardiovasc Toxicol.** 2018 Apr 11. doi: 10.1007/s12012-018-9454-2. [Epub ahead of print]
On the Efficacy of Cardio-Pulmonary Resuscitation and Epinephrine Following Cyanide- and H₂S Intoxication-Induced Cardiac Asystole.

Judenherc-Haouzi A1, Sonobe T2, Bebartá VS3, Haouzi P4.

Abstract

This study was aimed at determining the efficacy of epinephrine, followed by chest compressions, in producing a return of spontaneous circulation (ROSC) during cyanide (CN)- or hydrogen sulfide (H₂S)-induced toxic cardiac pulseless electrical activity (PEA) in the rat. Thirty-nine anesthetized rats were exposed to either intravenous KCN (n = 27) or H₂S solutions (n = 12), at a rate that led to a PEA within less than 10 min. In the group intoxicated by CN, 20 rats were mechanically ventilated and received either epinephrine (0.1 mg/kg i.v. n = 10) followed by chest compressions or saline (n = 10, "control CN") when in PEA. PEA was defined as a systolic pressure below 20 mmHg and a pulse pressure of less than 5 mmHg for 1 min. In addition, seven spontaneously breathing rats were also exposed to the same CN protocol, but infusion was stopped when a central apnea occurred; then, as soon as a PEA occurred, epinephrine (0.1 mg/kg IV) was administered while providing manual chest compressions and mechanical ventilation (CPR). Finally, 12 rats were intoxicated with H₂S, while mechanically ventilated, and received either saline (n = 6, "control H₂S") or epinephrine (n = 6) with CPR when in PEA. None of the control-intoxicated animals resuscitated (10 rats in the control CN group and 6 in the control H₂S group). In contrast, all the animals intoxicated with CN or H₂S that received epinephrine followed by chest compressions, returned to effective circulation. In addition, half of the spontaneously breathing CN-intoxicated animals that achieved ROSC after epinephrine resumed spontaneous breathing. In all the animals achieving ROSC, blood pressure, cardiac output, peripheral blood flow and [Formula: see text]O₂ returned toward baseline, but remained lower than the pre-intoxication levels (p < 0.01) with a persistent lactic acidosis. Epinephrine, along with CPR maneuvers, was highly effective in resuscitating rodents intoxicated with CN or H₂S. Since epinephrine is readily available in any ambulance, its place as an important countermeasure against mitochondrial poisons should be advocated. It remains critical to determine whether the systematic administration of epinephrine to any victims found hypotensive following CN or H₂S intoxication could prevent PEA, decrease post-ischemic brain injury and increase the efficacy of current antidotes by improving the circulatory status.

2. **Mil Med.** 2018 Mar 1;183(suppl_1):150-156. doi: 10.1093/milmed/usx163.

Non-invasive Dual-Channel Broadband Diffuse Optical Spectroscopy of Massive Hemorrhage and Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) in Swine.

Lam JH1, O'Sullivan TD2, Park TS3, Choi JH3, Warren RV1, Chen WP4, McLaren CE4, Cancio LC3, Batchinsky AI3, Tromberg BJ1.

Abstract

Objective: To quantitatively measure tissue composition and hemodynamics during resuscitative endovascular balloon occlusion of the aorta (REBOA) in two tissue compartments using non-invasive two-channel broadband diffuse optical spectroscopy (DOS).

Methods: Tissue concentrations of oxy- and deoxyhemoglobin (HbO₂ and HbR), water, and lipid were measured in a porcine model (n = 10) of massive hemorrhage (65% total blood volume over 1 h) and 30-min REBOA superior and inferior to the aortic balloon.

Results: After hemorrhage, hemoglobin oxygen saturation (StO₂ = HbO₂/[HbO₂ + HbR]) at both sites decreased significantly (-29.9% and -42.3%, respectively). The DOS measurements correlated with mean arterial pressure (MAP) (R₂ = 0.79, R₂ = 0.88), stroke volume (SV) (R₂ = 0.68, R₂ = 0.88), and heart rate (HR) (R₂ = 0.72, R₂ = 0.88). During REBOA, inferior StO₂ continued to decline while superior StO₂ peaked 12 min after REBOA before decreasing again. Inferior DOS parameters did not associate with MAP, SV, or HR during REBOA.

Conclusions: Dual-channel regional tissue DOS measurements can be used to non-invasively track the formation of hemodynamically distinct tissue compartments during hemorrhage and REBOA. Conventional systemic measures MAP, HR, and SV are uncorrelated with tissue status in inferior (downstream) sites. Multi-compartment DOS may provide a more complete picture of the efficacy of REBOA and similar resuscitation procedures.

3. **Brain Res.** 2018 Apr 9. pii: S0006-8993(18)30185-9. doi: 10.1016/j.brainres.2018.04.005. [Epub ahead of print]

Therapeutic time window and regulation of autophagy by mild hypothermia after intracerebral hemorrhage in rats.

Song F1, Guo C1, Geng Y1, Wu X1, Fan W2.

Abstract

Although recent studies have shown that mild hypothermia has neuroprotective effects on intracerebral hemorrhage (ICH), the therapeutic time window of the therapy and the role of autophagy as a potential neuroprotective mechanism remain unclear. This study was aimed to investigate the appropriate time window of mild hypothermia and the regulation of autophagy during the treatment in a rat model of autologous blood-injected ICH injury. The rats were divided into Sham, normothermic (NT) and hypothermic (HT) groups. HT groups received mild hypothermia (33°C-35°C) for 48h starting from 3h (HT3), 6h (HT6), and 12h (HT12) respectively after ICH. The neurological function, brain edema, blood brain barrier (BBB) permeability and volume of tissue loss were tested. The expression of matrix metalloproteinase 9 (MMP-9) and tight junction (TJ) protein including Occludin and Claudin-5 around the hematoma were detected by Western blot. Moreover, autophagy after ICH was detected by the ratio of LC3B-II/I, and the expression of Beclin-1 and p62, while apoptosis was evaluated by terminal deoxynucleotidyl transferase-mediated dURP nick end labelling (TUNEL) staining and expression of Bcl-2, Bim, cleaved Caspase-3. Compared with NT group, neurological deficit, brain edema and BBB permeability were attenuated in HT6 and HT12 groups, but not in HT3 group, while volume of tissue loss was reduced only in HT12 group. The expression of MMP-9 and the degradation of Occludin and Claudin-5 were suppressed only in HT6 and HT12 groups, especially in the latter one. Moreover, neuronal autophagy and apoptosis induced by ICH were downregulated in HT12 group. The results suggested that mild hypothermia initiated at 6h or 12h post-injury was neuroprotective in ICH model of rats, especially at 12h post-injury, via suppression of autophagy upregulated by ICH.

4. **Neonatology.** 2018 Apr 12;114(1):37-45. doi: 10.1159/000487988. [Epub ahead of print]

Comparison of Different Compression to Ventilation Ratios (2: 1, 3: 1, and 4: 1) during Cardiopulmonary Resuscitation in a Porcine Model of Neonatal Asphyxia.

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Abstract

BACKGROUND: High-quality chest compression is essential during neonatal cardiopulmonary resuscitation (CPR). However, the optimal compression to ventilation ratio (C:V) that should be used during neonatal CPR to optimize coronary and cerebral perfusion while providing adequate ventilation remains unknown.

OBJECTIVE: We hypothesized that different C:V ratios (e.g., 2: 1 or 4: 1) will reduce the time to return of spontaneous circulation (ROSC) in severely asphyxiated piglets.

METHODS: Thirty-one newborn piglets (1-4 days old) were anesthetized, intubated, instrumented, and exposed to 50-min normocapnic hypoxia followed by asphyxia. Piglets were randomized into 4 groups: 2: 1 (n = 8), 3: 1 (n = 8), 4: 1 (n = 8) C:V ratio, or a sham group (n = 7). Cardiac function, carotid blood flow, cerebral oxygenation, and respiratory parameters were continuously recorded throughout the experiment.

RESULTS: Thirty-one piglets were included in the study, and there was no difference in the duration of asphyxia or the degree of asphyxiation (as indicated by pH, PaCO₂, and lactate) among the different groups. The median (IQR) time to ROSC was similar between the groups with 127 (82-210), 96 (88-126), and 119 (83-256) s in the 2: 1, 3: 1, and 4: 1 C:V ratio groups, respectively (p = 0.67 between groups). Similarly, there was no difference in 100% oxygen requirement or epinephrine administration between the experimental groups.

CONCLUSIONS: Different C:V ratios resulted in similar ROSC, mortality, oxygen, and epinephrine administration during resuscitation in a porcine model of neonatal asphyxia.

5. **PLoS One.** 2018 Apr 12;13(4):e0195826. doi: 10.1371/journal.pone.0195826. eCollection 2018.

Effect of one-lung ventilation on end-tidal carbon dioxide during cardiopulmonary resuscitation in a pig model of cardiac arrest.

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Abstract

Unrecognized endobronchial intubation frequently occurs after emergency intubation. However, no study has evaluated the effect of one-lung ventilation on end-tidal carbon dioxide (ETCO₂) during cardiopulmonary resuscitation (CPR). We compared the hemodynamic parameters, blood gases, and ETCO₂ during one-lung ventilation with those during conventional two-lung ventilation in a pig model of CPR, to determine the effect of the former on ETCO₂. A randomized crossover study was conducted in 12 pigs intubated with double-lumen endobronchial tube to achieve lung separation. During CPR, the animals underwent three 5-min ventilation trials based on a randomized crossover design: left-lung, right-lung, or two-lung ventilation. Arterial blood gases were measured at the end of each ventilation trial. Ventilation was provided using the same tidal volume throughout the ventilation trials. Comparison using generalized linear mixed model revealed no significant group effects with respect to aortic pressure, coronary perfusion pressure, and carotid blood flow; however, significant group effect in terms of ETCO₂ was found ($P < 0.001$). In the post hoc analyses, ETCO₂ was lower during the right-lung ventilation than during the two-lung ($P = 0.006$) or left-lung ventilation ($P < 0.001$). However, no difference in ETCO₂ was detected between the left-lung and two-lung ventilations. The partial pressure of arterial carbon dioxide (PaCO₂), partial pressure of arterial oxygen (PaO₂), and oxygen saturation (SaO₂) differed among the three types of ventilation ($P = 0.003$, $P = 0.001$, and $P = 0.001$, respectively). The post hoc analyses revealed a higher PaCO₂, lower PaO₂, and lower SaO₂ during right-lung ventilation than during two-lung or left-lung ventilation. However, the levels of these blood gases did not differ between the left-lung and two-lung ventilations. In a pig model of CPR, ETCO₂ was significantly lower during right-lung ventilation than during two-lung ventilation. However, interestingly, ETCO₂ during left-lung ventilation was comparable to that during two-lung ventilation.

CASE REPORTS

1. **Medicine (Baltimore)**. 2018 Apr;97(15):e0285. doi: 10.1097/MD.00000000000010285.

Full recovery after prolonged resuscitation from cardiac arrest due to propafenone intoxication: A case report.

Ling B1, Geng P1, Tan D1, Walline J2.

Abstract

RATIONALE: The prognosis of cardiac arrest (CA) induced by propafenone intoxication was thought to be very poor. The maximal duration of cardiopulmonary resuscitation (CPR) for propafenone induced CA is unknown.

PATIENT CONCERNS: We describe a case that was successfully resuscitated after prolonged CPR (totaling 340 minutes during one hospital visit) for propafenone intoxication without subsequent neurological sequela.

DIAGNOSES: A previously healthy 36-year-old female who developed multiple and prolonged CAs after consuming 98 tablets of 50mg propafenone. The CPR duration of this case, to the best of our knowledge, is the longest of all existing propafenone-induced CPR events to still have full recovery. We also analyse the contributing factors to this successful CPR.

INTERVENTIONS: Sodium bicarbonate, inotropic drugs and pacemaker application did not prevent the occurrence of CA. A full recovery was eventually achieved after prolonged CPR with a mechanical CPR device, blood purification and other aggressive supportive treatments.

OUTCOMES: Full recovery without neurological sequela.

LESSONS: Prolonged CPR including the application of mechanical CPR devices should be considered in propafenone-related CA, especially in young patients without significant comorbidities and delayed resuscitation.

Free Article

2. **A A Pract**. 2018 Feb 6. doi: 10.1213/XAA.0000000000000736. [Epub ahead of print]

Successful Treatment of Refractory Cardiac Arrest With β -Blockade and Extracorporeal Life Support in a Pediatric Patient With Catecholaminergic Polymorphic Ventricular Tachycardia: A Case Report.

Cafferkey A1, McMahon C.

Abstract

We describe a case of refractory pulseless polymorphic ventricular tachycardia successfully treated with a bolus of propranolol intravenously, followed by an esmolol infusion and extracorporeal life support for 4 days in a 12-year-old boy later diagnosed with catecholaminergic polymorphic ventricular tachycardia. He had an excellent neurological outcome. Genetic testing for mutations associated with cardiac arrhythmias yielded a mutation of the syntrophin α -1 gene. The pathogenicity of this specific variant is uncertain. A mutation of this gene at a different locus is implicated in rare cases of long-QT syndrome. The patient subsequently underwent left cardiac sympathetic denervation followed by implantable cardiac defibrillator insertion. He remains symptom and arrhythmia free on atenolol.

3. **A A Pract.** 2018 Jan 15. doi: 10.1213/XAA.0000000000000707. [Epub ahead of print]

Successful Primary Percutaneous Coronary Intervention for Acute Myocardial Infarction During Resuscitation From Cardiac Arrest by Combined Mechanical Chest Compressions and Intra-aortic Balloon Pump Counterpulsation: A Case Report.

Kalogeropoulos AS, Kennon S, Karamasis GV, Smith EJ, Rees P.

Abstract

Prolonged cardiac arrest (CA) in patients with acute myocardial infarction can be associated with poor prognosis. Successful revascularization with primary percutaneous coronary intervention (pPCI) remains the reference therapy for these patients. However, performing a pPCI during CA is challenging and the use of automatic chest compression devices or mechanical support systems might be warranted to facilitate the pPCI procedure and achieve good outcomes. We present a patient with inferior myocardial infarction and cardiogenic shock, followed by refractory CA who underwent successful pPCI with a novel approach integrating the simultaneous use of an automated chest compression system and intra-aortic balloon pump counterpulsation.