RCP – COMPRESSIONS TORÀCIQUES MECÀNIQUES

1. Am J Ther. 2019 Mar/Apr;26(2):e276-e283. doi: 10.1097/MJT.0000000000000927.

Cardiac Arrest in Special Circumstances-Recent Advances in Resuscitation.

Cimpoesu D(1), Corlade-Andrei M(1), Popa TO(1), Grigorasi G(1), Bouros C(1), Rotaru L(2), Nedelea PL(1).

Abstract

BACKGROUND: Cardiopulmonary resuscitation (CPR) in special circumstances includes the emergency intervention for special causes, special environments, and special patients. Special causes cover the potential reversible causes of cardiac arrest that must be identified or excluded during any resuscitation act. The special environments section includes recommendations for the treatment of cardiac arrest occurring in specific locations: cardiac surgery, catheterization laboratory, dialysis unit, dental surgery, commercial airplanes or air ambulances, playing field, difficult environment (eg, drowning, high altitude, avalanche, and electrical injuries) or mass casualty incident. CPR for special patients gives guidance for the patients with severe comorbidities (asthma, heart failure with ventricular assist devices, neurological disease, and obesity) and pregnant women or older people.

AREAS OF UNCERTAINTY: There are no generally worldwide accepted resuscitation guidelines for special circumstance, and there are still few studies investigating the safety and outcome of cardiac arrest in special circumstances. Applying standard advanced life support (ALS) guidelines in this situation is not enough to obtain better results from CPR, for example, cardiac arrest caused by electrolyte abnormalities require also the treatment of that electrolyte disturbance, not only standard CPR, or in the case of severe hypothermia, when standard ALS approach is not recommended until a temperature threshold is reached after warming measures. Data sources for this article are scientific articles describing retrospective studies conducted in CPR performed in special circumstances, experts' consensus, and related published opinion of experts in CPR.

THERAPEUTIC ADVANCES: The newest advance in therapeutics applied to resuscitation field for these particular situations is the use of extracorporeal life support/extracorporeal membrane oxygenation devices during CPR.

CONCLUSIONS: In special circumstances, ALS guidelines require modification and special attention for causes, environment, and patient particularities, with specific therapeutic intervention concomitant with standard ALS.

2. JACC Basic Transl Sci. 2019 Feb 25;4(1):116-121. doi: 10.1016/j.jacbts.2018.12.004. eCollection 2019 Feb.

Chest Compressions During Sustained Inflation During Cardiopulmonary Resuscitation in Newborn Infants Translating Evidence From Animal Studies to the Bedside.

Schmölzer GM(1).

Abstract

Newborn infants receiving chest compressions in the delivery room have a high incidence of mortality (41%) and short-term neurological morbidity (e.g., 57% hypoxic-ischemic encephalopathy and seizures). Furthermore, infants who have no signs of life at 10 min despite chest compressions have 83% mortality, with 93% of survivors experiencing moderate-to-severe disability. The poor prognosis associated with receiving chest compressions in the delivery room raises questions as to whether improved cardiopulmonary resuscitation methods specifically tailored to the newborn could improve outcomes. Combining chest compressions during sustained inflation (CC+SI) has recently been shown to improve morbidity and mortality outcomes during cardiopulmonary resuscitation. Overall, CC+SI accomplishes the following: 1) significantly reduces time to return of spontaneous circulation, mortality, and epinephrine administration, and improves systemic and regional hemodynamic recovery; 2) significantly increases tidal volume and minute ventilation, and therefore alveolar oxygen delivery; 3) allows for passive ventilation during chest compression; and 4) does not increase lung or brain injury markers compared with the current standard of using 3:1 compression:ventilation ratio. A randomized trial comparing CC+SI versus a 3:1 compression:ventilation ratio during cardiopulmonary resuscitation in the delivery room is therefore warranted.

3. Prehosp Emerg Care. 2018 Mar-Apr;22(2):214-221. doi: 10.1080/10903127.2017.1367443. Epub 2017 Sep 27.

Neurological Favorable Outcomes Associated with EMS Compliance and On-Scene Resuscitation Time Protocol.

Kim TH, Lee EJ, Shin SD, Ro YS, Kim YJ, Ahn KO, Song KJ, Hong KJ, Lee KW.

Abstract:

PURPOSE: Korean national emergency care protocol for EMS providers recommends a minimum of 5 minutes of on-scene resuscitation before transport to hospital in cases of Out-of-Hospital Cardiac Arrest (OHCA). We compared survival outcome of OHCA patients according to scene time interval (STI)-protocol compliance of EMS.

METHODS: EMS treated adult OHCAs with presumed cardiac etiology during a two-year period were analyzed. Non-compliance was defined as hospital transport with STI less than 6 minutes without return of spontaneous circulation (ROSC) on scene. Propensity score for compliance with protocol was calculated and based on the calculated propensity score, 1:1 matching was performed between compliance and non-compliance group. Univariate analysis as well as multivariable logistic model was used to evaluate the effect of compliance to survival outcome.

RESULTS: Among a total of 28,100 OHCAs, EMS transported 7,026 (25.0%) cardiac arrests without ROSC on the scene with an STI less than 6 minutes. A total of 6,854 cases in each group were matched using propensity score matching. Overall survival to discharge rate did not differ in both groups (4.6% for compliance group vs. 4.5 for non-compliance group, $p = 0.78$). Adjusted odds ratio of compliance for survival to discharge were 1.12 (95% CI 0.92-1.36). More patients with favorable neurological outcome was shown in compliance group (2.5% vs. 1.7%, $p < 0.01$) and adjusted odds ratio was 1.91 (95% CI 1.42-2.59).

CONCLUSIONS: Although survival to discharge rate did not differ for patient with EMS non-compliance with STI protocol, lesser patients survived with favorable neurological outcomes when EMS did not stay for sufficient time on scene in OHCA before transport.

FREE ARTICLE

REGISTRES, REVISIONS I EDITORIALS

1. Intensive Care Med. 2019 Mar 8. doi: 10.1007/s00134-019-05580-7. [Epub ahead of print]

Variability in functional outcome and treatment practices by treatment center after out-of-hospital cardiac arrest: analysis of International Cardiac Arrest Registry.

May TL(1)(2), Lary CW(3), Riker RR(4), Friberg H(5), Patel N(6), Søreide E(7)(8), McPherson JA(9), Undén J(10)(11), Hand R(12), Sunde K(13)(14), Stammet P(15), Rubertsson S(16), Belohlvaek J(17), Dupont A(18), Hirsch KG(19), Valsson F(20), Kern K(21), Sadaka F(22), Israelsson J(23), Dankiewicz J(9)(24), Nielsen N(25), Seder DB(4), Agarwal S(26).

Abstract

PURPOSE: Functional outcomes vary between centers after out-of-hospital cardiac arrest (OHCA) and are partially explained by pre-existing health status and arrest characteristics, while the effects of in-hospital treatments on functional outcome are less understood. We examined variation in functional outcomes by center after adjusting for patient- and arrest-specific characteristics and evaluated how in-hospital management differs between high- and low-performing centers.

METHODS: Analysis of observational registry data within the International Cardiac Arrest Registry was used to perform a hierarchical model of center-specific risk standardized rates for good outcome, adjusted for demographics, pre-existing functional status, and arrest-related factors with treatment center as a random effect variable. We described the variability in treatments and diagnostic tests that may influence outcome at centers with adjusted rates significantly above and below registry average.

RESULTS: A total of 3855 patients were admitted to an ICU following cardiac arrest with return of spontaneous circulation. The overall prevalence of good outcome was 11-63% among centers. After adjustment, center-specific risk standardized rates for good functional outcome ranged from 0.47 (0.37-0.58) to 0.20 (0.12-0.26). High-performing centers had faster time to goal temperature, were more likely to have goal temperature of 33 °C, more likely to perform unconscious cardiac catheterization and percutaneous coronary intervention, and had differing prognostication practices than low-performing centers.

CONCLUSIONS: Center-specific differences in outcomes after OHCA after adjusting for patient-specific factors exist. This variation could partially be explained by in-hospital management differences. Future research should address the contribution of these factors to the differences in outcomes after resuscitation.

FREE ARTCLE

2. Intensive Care Med. 2019 Mar 6. doi: 10.1007/s00134-019-05572-7. [Epub ahead of print]

Cerebral oximetry in cardiac arrest: a potential role but with limitations.

Sandroni C(1), Parnia S(2), Nolan JP(3)(4).

NO ABSTRACT

FREE ARTICLE

3. Resuscitation. 2019 Mar 2. pii: S0300-9572(19)30048-6. doi: 10.1016/j.resuscitation.2019.02.031. [Epub ahead of print]

Early withdrawal of life support after resuscitation from cardiac arrest is common and may result in additional deaths.

May TL(1), Ruthazer R(2), Riker RR(3), Friberg H(4), Patel N(5), Soreide E(6), Hand R(7), Stammet P(8), Dupont A(9), Hirsch KG(10), Agarwal S(11), Wanscher MJ(12), Dankiewicz J(4), Nielsen N(13), Seder DB(3), Kent DM(2).

Abstract

AIM: "Early" withdrawal of life support therapies (eWLST) within the first 3 calendar days after resuscitation from cardiac arrest (CA) is discouraged. We evaluated a prospective multicenter registry of patients admitted to hospitals after resuscitation from CA to determine predictors of eWLST and estimate its impact on outcomes.

METHODS: CA survivors enrolled from 2012-2017 in the International Cardiac Arrest Registry (INTCAR) were included. We developed a propensity score for eWLST and matched a cohort with similar probabilities of eWLST who received ongoing care. The incidence of good outcome (Cerebral Performance Category of 1 or 2) was measured across deciles of eWLST in the matched cohort.

RESULTS: 2688 patients from 24 hospitals were included. Median ischemic time was 20 (IQR 11, 30) minutes, and 1148 (43%) had an initial shockable rhythm. Withdrawal of life support occurred in 1162 (43%) cases, with 459 (17%) classified as eWLST. Older age, initial non-shockable rhythm, increased ischemic time, shock on admission, out-of-hospital arrest, and admission in the United States were each independently associated with eWLST. All patients with eWLST died, while the matched cohort, good outcome occurred in 21% of patients. 19% of patients within the eWLST group were predicted to have a good outcome, had eWLST not occurred.

CONCLUSIONS: Early withdrawal of life support occurs frequently after cardiac arrest. Although the mortality of patients matched to those with eWLST was high, these data showed excess mortality with eWLST.

4. Am J Emerg Med. 2019 Feb 16. pii: S0735-6757(19)30098-1. doi: 10.1016/j.ajem.2019.02.020. [Epub ahead of print]

Awareness during resuscitation: Where is the data?

Varon J(1).

NO ABSTRACT

ACR INTRA-HOSPITALÀRIA

1. Resuscitation. 2019 Feb 27. pii: S0300-9572(19)30046-2. doi: 10.1016/j.resuscitation.2019.02.027. [Epub ahead of print]

Association between left ventricular outflow tract opening and successful resuscitation after cardiac arrest.

Catena E(1), Ottolina D(1), Fossali T(1), Rech R(1), Borghi B(1), Perotti A(1), Ballone E(1), Bergomi P(1), Corona A(1), Castelli A(1), Colombo R(2).

Abstract

BACKGROUND: Survival after cardiac arrest depends on adequate cardiopulmonary resuscitation (CPR). Manual or mechanical external chest compression may be ineffective to restore circulation: structures subjected to external chest compression may differ in forces transfer to intrathoracic structures due to anatomic characteristics and physiological changes. This clinical study aims to assess the association of trans-oesophageal findings during CPR and successful resuscitation.

METHODS: Retrospective cohort study. Trans-oesophageal assessment of right ventricular fractional area change, right ventricular outflow tract fractional shortening, left ventricular volumes, ejection fraction, and aortic diameters were performed in refractory out-of-hospital cardiac arrest patients admitted to emergency department for extracorporeal CPR.

RESULTS: 19 patients were analyzed. 15 of 19 patients (79%) received venous-arterial extracorporeal membrane oxygenation support. Resuscitation was successful with return of spontaneous circulation or electromechanical activity in 7 patients (group-SUXX) and failed in 12 patients (group-FAIL). 6 patients (32%) were alive at 24 h from the cardiac arrest, one patient (5%) survived to hospital discharge. Left ventricular outflow tract (LVOT) was open during CPR in all patients in group-SUXX and in 1 patient in group-FAIL (p 0.0002). None of the patients with closed LVOT had successful resuscitation. Patients in group-SUXX had a higher ejection fraction (p 0.03), ascending aortic diameter (p 0.04), and survival rate than those in group-FAIL (p 0.015). In a multiple variable Cox's proportional model LVOT opening was the only variable associated with successful resuscitation.

CONCLUSIONS: Trans-oesophageal echocardiography can be useful in the emergency setting of cardiopulmonary arrest for discriminating between successful and failing resuscitation.

2. Rev Med Chil. 2019;147(1):34-40. doi: 10.4067/S0034-98872019000100034.

[Registry of perioperative cardiac arrests in a clinical hospital in the period 2006-2017].
[Article in Spanish]

Aguirre C MM(1), Mayanz S S(2), Blanch Z A(1), Aranibar L H(3), Salazar T A(3), Roizen G G(3), Álvarez N MG(4), Izquierdo A C(5), Penna S A(1).

Abstract

BACKGROUND:

Perioperative cardiac arrest (PCA) is a rare but important event in the operating room.

AIM: To describe PCA events at a Clinical Hospital in Santiago, Chile.

MATERIAL AND METHODS: Registry of PCA that occurred in the operating room (OR) and during procedures not carried out in the OR between September 2006 and November 2017. Precipitating events, type of anesthesia and results of resuscitation maneuvers were described.

RESULTS: Eighty events (five outside of the OR) during 170,431 surgical procedures were recorded, resulting in an incidence of 4.4 events per 10,000 interventions. Hypotension/hypoperfusion was the most frequently found preexisting condition (42.5%). The main cause was the presence of preoperative complications (57.5%). Nineteen cases (23.8%) were attributable to anesthesia, with an incidence of 1.11 per 10,000 anesthetic procedures. Survival rate at hospital discharge was 52.5%. The figure for PCA caused by anesthesia was 84.2%.

CONCLUSIONS: The incidence of PCA and its survival is similar to that reported abroad. In general, PCA has a better prognosis than other types of cardiac arrest, especially if it has an anesthetic cause.

FREE ARTICLE

3. Resuscitation. 2019 Mar 1;137:175-182. doi: 10.1016/j.resuscitation.2019.02.038. [Epub ahead of print]

Hypoxic liver injury after in- and out-of-hospital cardiac arrest: Risk factors and neurological outcome.

Roedl K(1), Spiel AO(2), Nürnberger A(3), Horvatits T(4), Drolz A(5), Hubner P(6), Warenits AM(7), Sterz F(8), Herkner H(9), Fuhrmann V(10).

Abstract

BACKGROUND: Hypoxic liver injury (HLI) is a frequent and life-threatening complication in critically ill patients that occurs in up to ten percent of critically ill patients. However, there is a lack of data on HLI following cardiac arrest and its clinical implications on outcome. Aim of this study was to investigate incidence, outcome and functional outcome of patients with HLI after in-hospital cardiac arrest (IHCA) and out-of-hospital cardiac arrest (OHCA).

METHODS: We conducted an analysis of a cardiac arrest registry data over a 7-year period. All patients with non-traumatic OHCA and IHCA with return of spontaneous circulation (ROSC) treated at the emergency department of a tertiary care hospital were included in the study. HLI was defined according to established

criteria. Predictors of HLI, occurrence, clinical and neurological outcome were assessed using multivariable regression.

RESULTS: Out of 1068 patients after IHCA and OHCA with ROSC, 219 (21%) patients developed HLI. Rate of HLI did not differ significantly in IHCA and OHCA patients. Multivariate regression analysis identified time-to-ROSC [OR 1.18, 95% CI (1.01-1.38); p < 0.05], presence of cardiac failure [OR 2.57, 95% CI (1.65-4.01); p < 0.001] and Charlson comorbidity index [OR 0.83, 95% CI (0.72-0.95); p < 0.01] as independent predictors for occurrence of HLI. Good functional outcome was significantly lower in patients suffering from HLI after 28-days (35% vs. 48%, p < 0.001) and 1-year (34% vs. 44%, p < 0.001). Occurrence of HLI was associated with unfavourable neurological outcome [OR 1.74, 95% CI (1.16-2.61); p < 0.01] in multivariate regression analysis.

CONCLUSION: New onset of HLI is a frequent finding after IHCA and OHCA. HLI is associated with increased mortality, unfavourable neurological and overall outcome

CAUSES DE L'ACR

1. Handb Clin Neurol. 2018;157:547-563. doi: 10.1016/B978-0-444-64074-1.00033-1.

Accidental hypothermia.

Paal P(1), Brugger H(2), Strapazzon G(2).

Abstract

Accidental hypothermia causes profound changes to the body's physiology. After an initial burst of agitation (e.g., 36-37°C), vital functions will slow down with further cooling, until they vanish (e.g. <20-25°C). Thus, a deeply hypothermic person may appear dead, but may still be able to be resuscitated if treated correctly. The hospital use of minimally invasive rewarming for nonarrested, otherwise healthy patients with primary hypothermia and stable vital signs has the potential to substantially decrease morbidity and mortality for these patients. Extracorporeal life support (ECLS) has revolutionized the management of hypothermic cardiac arrest, with survival rates approaching 100%. Hypothermic patients with risk factors for imminent cardiac arrest (i.e., temperature <28°C, ventricular arrhythmia, systolic blood pressure <90 mmHg), and those who have already arrested, should be transferred directly to an ECLS center. Cardiac arrest patients should receive continuous cardiopulmonary resuscitation (CPR) during transfer. If prolonged transport is required or terrain is difficult, mechanic CPR can be helpful. Intermittent CPR may be appropriate in hypothermic arrest when continuous CPR is impossible. Modern postresuscitation care should be implemented following hypothermic arrest. Structured protocols should be in place to optimize prehospital triage, transport, and treatment as well as in-hospital management, including detailed criteria and protocols for the use of ECLS and postresuscitation care.

2. Resuscitation. 2019 Mar 1. pii: S0300-9572(18)30955-9. doi: 10.1016/j.resuscitation.2019.02.039. [Epub ahead of print]

Outcome after pre-hospital cardiac arrest in accordance with underlying cause.

Gässler H(1), Fischer M(2), Wnent J(3), Seewald S(3), Helm M(4).

Abstract

AIM: In terms of treatment options, the underlying cause of out-of-hospital cardiac arrest (OHCA) has an impact on survival. This study aimed to examine the frequencies of different causes of OHCA and their outcomes using data from a national resuscitation registry.

METHODS: All pre-hospital cardiopulmonary resuscitations (CPR) documented in the German Resuscitation Registry between 2007 and 2017 were retrospectively investigated with regard to cause of cardiac arrest, return of spontaneous circulation (ROSC), and hospital discharge rate with good neurological outcome. To avoid selection bias, only rescue services with a return rate in the form 'further clinical treatment' of > 30% were included, this resulted in a total return rate of 84% of the included data.

RESULTS: In total, 33,772 patients were included. The most common causes of OHCA were cardiac events (62.2%), hypoxia (11.1%) and trauma (3.2%), in 17.2% no or unknown cause were documented. Overall, 44.8% of patients achieved ROSC, 13.1% of patients were discharged alive from hospital and 68.3% of these were in good neurological condition (9.0% of all patients). ROSC rates differed between 8.9% (sudden infant death syndrome) and 64.4% (intracranial bleeding), while discharge rates with good neurological outcome ranged between 0.9% (sepsis) and 14.0% (intoxication).

CONCLUSION: The most common causes of OHCA are cardiac events and hypoxia. Depending on the underlying cause, outcome after pre-hospital CPR varies widely with a survival rate with good neurological outcome ranging from 0.9 to 14%.

END-TIDAL CO_2

1. Arch Dis Child Fetal Neonatal Ed. 2019 Mar;104(2):F187-F191. doi: 10.1136/archdischild-2017-313982. Epub 2018 Mar 17.

Detection of exhaled carbon dioxide following intubation during resuscitation at delivery.

Hunt KA(1)(2), Yamada Y(1)(2), Murthy V(1)(2), Srihari Bhat P(1)(2), Campbell M(3), Fox GF(4), Milner AD(1)(2), Greenough A(1)(2)(5).

Abstract

OBJECTIVES: End tidal carbon dioxide ($ETCO_2$) monitoring can facilitate identification of successful intubation. The aims of this study were to determine the time to detect $ETCO_2$ following intubation during resuscitation of infants born prematurely and whether it differed according to maturity at birth or the Apgar scores (as a measure of the infant's condition after birth).

DESIGN: Analysis of recordings of respiratory function monitoring.

SETTING: Two tertiary perinatal centres.

PATIENTS: Sixty-four infants, with median gestational age of 27 (range 23-34)weeks.

INTERVENTIONS: Respiratory function monitoring during resuscitation in the delivery suite.

MAIN OUTCOME MEASURES: The time following intubation for $ETCO_2$ levels to be initially detected and to reach 4 mm Hg and 15 mm Hg.

RESULTS: The median time for initial detection of $ETCO_2$ following intubation was 3.7 (range 0-44) s, which was significantly shorter than the median time for $ETCO_2$ to reach 4 mm Hg (5.3 (range 0-727) s) and to reach 15 mm Hg (8.1 (range 0-827) s) (both $P<0.001$). There were significant correlations between the time for $ETCO_2$ to reach 4 mm Hg ($r=-0.44$, $P>0.001$) and 15 mm Hg ($r=-0.48$, $P<0.001$) and gestational age but not with the Apgar scores.

CONCLUSIONS: The time for $ETCO_2$ to be detected following intubation in the delivery suite is variable emphasising the importance of using clinical indicators to assess correct endotracheal tube position in addition to $ETCO_2$ monitoring. Capnography is likely to detect $ETCO_2$ faster than colorimetric devices.

2. Resuscitation. 2019 Mar 2. pii: S0300-9572(19)30047-4. doi: 10.1016/j.resuscitation.2019.02.028. [Epub ahead of print]

Value of capnography to predict defibrillation success in out-of-hospital cardiac arrest.

Chicote B(1), Aramendi E(2), Irusta U(2), Owens P(3), Daya M(4), Idris A(3).

Abstract

BACKGROUND AND AIM: Unsuccessful defibrillation shocks adversely affect survival from out-of-hospital cardiac arrest (OHCA). Ventricular fibrillation (VF) waveform analysis is the tool-of-choice for the non-invasive prediction of shock success, but surrogate markers of perfusion like end-tidal CO_2 ($EtCO_2$) could improve the prediction. The aim of this study was to evaluate $EtCO_2$ as predictor of shock success, both individually and in combination with VF-waveform analysis.

MATERIALS AND METHODS: In total 514 shocks from 214 OHCA patients (75 first shocks) were analysed. For each shock three predictors of defibrillation success were automatically calculated from the device files: two VF-waveform features, amplitude spectrum area (AMSA) and fuzzy entropy (FuzzyEn), and the median $EtCO_2$ ($MEtCO_2$) in the minute before the shock. Sensitivity, specificity, receiver operating characteristic (ROC) curves and area under the curve (AUC) were calculated, for each predictor individually and for the combination of $MEtCO_2$ and VF-waveform predictors. Separate analyses were done for first shocks and all shocks.

RESULTS: $MEtCO_2$ in first shocks was significantly higher for successful than for unsuccessful shocks (31mmHg/25mmHg, $p<0.05$), but differences were not significant for all shocks (32mmHg/29mmHg, $p>0.05$). $MEtCO_2$ predicted shock success with an AUC of 0.66 for first shocks, but was not a predictor for all shocks (AUC 0.54). AMSA and FuzzyEn presented AUCs of 0.76 and 0.77 for first shocks, and 0.75 and 0.75 for all shocks. For first shocks, adding $MEtCO_2$ improved the AUC of AMSA and FuzzyEn to 0.79 and 0.83, respectively.

CONCLUSIONS: $MEtCO_2$ predicted defibrillation success only for first shocks. Adding $MEtCO_2$ to VF-waveform analysis in first shocks improved prediction of shock success. VF-waveform features and $MEtCO_2$ were automatically calculated from the device files, so these methods could be introduced in current defibrillators adding only new software.

3. Anesthesiology. 2019 Mar 1. doi: 10.1097/ALN.0000000000002646. [Epub ahead of print]

An Anesthesiologist's Perspective on the History of Basic Airway Management: The "Modern" Era, 1960 to Present.

Matioc AA(1).

Abstract

This fourth and last installment of my history of basic airway management discusses the current (i.e., "modern") era of anesthesia and resuscitation, from 1960 to the present. These years were notable for the implementation of intermittent positive pressure ventilation inside and outside the operating room. Basic airway management in cardiopulmonary resuscitation (i.e., expired air ventilation) was de-emphasized, as the "A-B-C" (airway-breathing-circulation) protocol was replaced with the "C-A-B" (circulation-airway-breathing) intervention sequence. Basic airway management in the operating room (i.e., face-mask ventilation) lost its predominant position to advanced airway management, as balanced anesthesia replaced inhalation anesthesia. The one-hand, generic face-mask ventilation technique was inherited from the progressive era. In the new context of providing intermittent positive pressure ventilation, the generic technique generated an underpowered grip with a less effective seal and an unspecified airway maneuver. The significant advancement that had been made in understanding the pathophysiology of upper airway obstruction was thus poorly translated into practice. In contrast to consistent progress in advanced airway management, progress in basic airway techniques and devices stagnated.

DONACIÓ D'ÒRGANS

1. Ann Surg. 2019 Feb 8. doi: 10.1097/SLA.0000000000003218. [Epub ahead of print]

Outcomes From Brain Death Donors With Previous Cardiac Arrest Accepted for Pancreas Transplantation: A Single-center Retrospective Analysis.

Ventura-Aguiar P(1)(2), Ferrer J(3), Paredes D(4), Rodriguez-Villar C(4), Ruiz A(4), Fuster J(3), Fondevila C(3), Garcia-Valdecasas JC(3), Esmatjes E(5), Adália R(4), Oppenheimer F(1)(2)(6), Campistol JM(1)(6), Diekmann F(1)(2)(6), Ricart MJ(1).

Abstract

OBJECTIVE: The aim of the study was to evaluate the effect of cardiac arrest time (CAT) in donors after brain death (DBD) donors on pancreas transplant outcome.

SUMMARY OF BACKGROUND DATA: Results from donors after circulatory death report good outcomes despite warm ischemia times up to 57 minutes. Previous cardiac arrest in DBD has been addressed as a potential risk factor, but duration of the CAT has never been evaluated.

METHODS: We conducted a retrospective analysis including 342 pancreas transplants performed at our center from 2000 to 2016 and evaluated the effect of previous cardiac arrest in DBD (caDBD) on pancreas transplant outcomes.

RESULTS: A total of 49 (14.3%) caDBD were accepted for transplantation [median CAT of 5.0 min (IQR 2.5-15.0)]. Anoxic encephalopathy was most frequent and P-PASS higher (16.9 vs 15.6) in caDBD group when compared with other DBD. No differences were found in all other characteristics evaluated.Graft survival

was similar between both groups, as was the incidence of early graft failure (EGF). CAT increased the risk for EGF [OR 1.09 (95% CI, 1.01-1.17)], and the duration of CPR discriminated for EGF [AUC of 0.86 (95% CI, 0.74-0.98)], with a sensitivity and specificity of 100% and 75% at a cutoff of 15 minutes. When evaluated separately, caDBD >15 min increased over 5 times the risk for EGF [HR 5.80 (95% CI, 1.82-18.56); P = 0.003], and these presented fewer days on the ICU (1.0 vs 3.0 d).

CONCLUSION: CaDBD donors are suitable for routine pancreas transplantation without increasing EGF risk, and in those with longer CAT it may be prudent to postpone donation a few days to allow a thorough evaluation of organ damage following cardiac arrest.

FÀRMACS

1. Resuscitation. 2019 Mar 5. pii: S0300-9572(19)30053-X. doi: 10.1016/j.resuscitation.2019.02.036. [Epub ahead of print]

Interpreting observational data on adrenaline in cardiac arrest is complicated.

Lin S(1), Dorian P(2).

NO ABSTRACT

TRAUMA

1. Resuscitation. 2019 Feb 27. pii: S0300-9572(18)30998-5. doi: 10.1016/j.resuscitation.2019.02.029. [Epub ahead of print]

Cardiac massage for trauma patients in the battlefield: An assessment for survivors.

Anderson KL(1), Mora AG(2), Bloom AD(3), Maddry JK(4), Bebarta VS(5).

Abstract

INTRODUCTION: Survival from traumatic cardiopulmonary arrest (TCA) has been reported at a rate as low as 0-2.6% in the civilian pre-hospital setting, and many consider resuscitation of this group to be futile. The aim of this investigation was to describe patients who received cardiac massage during TCA in a battlefield setting; we also aimed to identify predictors of survival.

METHODS: We conducted a review of the Department of Defense Trauma Registry to identify patients who received cardiac massage in the battlefield between 2007 and 2014. Patients were also grouped according to location of cardiac arrest: pre-hospital (PH) and in-hospital (IH). The groups were compared and evaluated by injury, transport time, type of resuscitation, and pre-hospital procedures. Outcome variables included survival to discharge and 30-day survival. Categorical variables were analysed using chi-square or

Fisher's exact tests. Wilcoxon tests were performed for continuous variables. Regression modelling was used to assess for predictors of survival.

RESULTS: 75 of all 582 patients (13%, 95% CI 10-16) survived to 30 days, and all survivors were transported out of the battlefield; 23 PH (7.8%, 95% CI 5.2-12) and 52 IH (17%, 95% CI 13-22) patients survived to 30 days ($p < 0.001$). Closed-chest cardiac massage with the administration of intravenous medications was associated with 30-day survival among IH patients.

CONCLUSIONS: We report a 13% survival to 30 days among all patients receiving cardiac massage in a battlefield setting. Closed-chest cardiac massage predicted survival among IH TCA victims who also received intravenous medications in this review of combat-related TCA.

VENTILACIÓ

1. Arch Dis Child Fetal Neonatal Ed. 2019 Mar;104(2):F122-F127. doi: 10.1136/archdischild-2018-314860. Epub 2018 May 4.

T-piece resuscitators: how do they compare?

Hinder M(1)(2), McEwan A(2), Drevhammer T(3), Donaldson S(3), Tracy MB(1)(4).

Abstract:

BACKGROUND: The T-piece resuscitator (TPR) has seen increased use as a primary resuscitation device with newborns. Traditional TPR design uses a high resistance expiratory valve to produce positive end expiratory pressure (PEEP) or continuous positive airway pressure (CPAP) at resuscitation. A new TPR device that uses a dual flow ratio valve (fluidic flip) to produce PEEP/CPAP is now available (rPAP). We aimed to compare the measured ventilation performance of different TPR devices in a controlled bench test study.

DESIGN/METHODS: Single operator provided positive pressure ventilation to an incremental testlung compliance (Crs) model (0.5-5 mL/cmH_2O) with five different brands of TPR device (Atom, Neopuff, rPAP, GE Panda warmer and Draeger Resuscitaire). At recommended peak inflation pressure (PIP) 20 cmH_2O, PEEP of 5 cmH_2O and rate of 60 inflations per minute.

RESULTS: 1864 inflations were analysed. Four of the five devices tested demonstrated inadvertent elevations in mean PEEP (5.5-10.3 cmH_2O, $p<0.001$) from set value as Crs was increased, while one device (rPAP) remained at the set value. Measured PIP exceeded the set value in two infant warmer devices (GE and Draeger) with inbuilt TPR at Crs of 0.5 (24.5 and 23.5 cmH_2O, $p<0.001$). Significant differences were seen in tidal volumes across devices particularly at higher Crs ($p<0.001$).

CONCLUSIONS: Results show important variation in delivered ventilation from set values due to inherent TPR device design characteristics with a range of lung compliances expected at birth. Device-generated inadvertent PEEP and overdelivery of PIP may be clinically deleterious for term and preterm newborns or infants with larger Crs during resuscitation.

ECOGRAFIA A LA RESSUSCITACIÓ

1. Eur Heart J Cardiovasc Imaging. 2018 Jul 1;19(7):800-807. doi: 10.1093/ehjci/jex184.

Right ventricular function assessed by 2D strain analysis predicts ventricular arrhythmias and sudden cardiac death in patients after acute myocardial infarction.

Risum N(1), Valeur N(2), Søgaard P(3), Hassager C(1), Køber L(1), Ersbøll M(1).

Abstract:

Aims: Left ventricular function is a well-established predictor of malignant ventricular arrhythmias, but little is known about the importance of right ventricular (RV) function. The aim of this study was to investigate the importance of RV function for prediction of sudden cardiac death (SCD) or malignant ventricular arrhythmias (VAs) after acute myocardial infarction (MI).

Methods and results: A total of 790 patients with acute MI were prospectively included. All patients had 2D strain echocardiography performed to evaluate right ventricular (RV) free wall strain (RVS) and RV mechanical dispersion (MD) defined as the standard deviation of time to peak negative strain in all myocardial segments. The primary composite end point [SCD, admission with VA or appropriate therapy from a primary prophylactic implantable cardioverter-defibrillator (ICD)] was analysed with Cox models. Mean age was 69 ± 12 years, and 74% were male. Thirty-one patients experienced the primary end point during a median follow-up of 898 days (Q1-Q3 704-981). RVS was independently associated with outcome in a multivariable model including age and left ventricular global longitudinal strain; pr 1% change [hazard ratio (HR) 1.08, 95% confidence interval (CI) 1.01-1.15; P = 0.038]. Patients in the lower tertile (poor strain) showed a 10-fold risk of an event compared with the upper tertile (HR 9.8, 95% CI 2.23-42.3; P = 0.002). RV MD was not independently associated with VA/SCD (HR 0.99, 95% CI 0.91-1.09; P = 0.93). RVS proved superior to tricuspid annular plane systolic excursion (TAPSE) (P = 0.03) in the multivariable model.

Conclusion: RVS, but not RV MD, was significantly and independently related to SCD/VA in patients with acute MI. Furthermore, RVS was shown to be superior to TAPSE.

MONITOTATGE CEREBRAL

1. Clin Neurophysiol Pract. 2019 Jan 25;4:20-26. doi: 10.1016/j.cnp.2018.12.001. eCollection 2019.

Sources of interrater variability and prognostic value of standardized EEG features in post-anoxic coma after resuscitated cardiac arrest.

Benarous L(1), Gavaret M(2), Soda Diop M(2), Tobarias J(1), de Ghaisne de Bourmont S(1), Allez C(1), Bouzana F(1), Gainnier M(1), Trebuchon A(2).

Abstract

Objectives: To assess interrater variability and prognostic value of simple EEG features based on the recent American Clinical Neurophysiology Society (ACNS) classification in post cardiac arrest comatose patients.

Methods: All patients admitted for a resuscitated cardiac arrest in a university hospital were prospectively included in the study. EEG interpretation was made by 3 independent neurophysiologists (2 senior and 1 junior) blind to the outcome. Kappa score and prognostic performances were estimated for each EEG pattern and discrepancies were analyzed.

Results: 122 cardiac arrest patients were admitted of whom 48 went through a full neurologic evaluation. Eighty-one percent had an unfavorable outcome. Burst suppression, paroxystic seizure activity, and non-reactive EEG were strongly associated with an unfavorable evolution. Kappa score between the senior neurophysiologists was excellent or substantial while it was only fair or slight between the junior and senior neurophysiologists. Reactivity, discontinuity and electrographic seizure were patterns particularly subject to discrepancy.

Conclusions: Bedside EEG is an excellent tool for predicting outcome of post-anoxic coma through simple EEG features. However, the interrater variability emphasizes the need to be well trained for the standardized methods of evaluating EEG parameters.

Significance: A second look at complex patterns seems mandatory. The development of automated tools could help to improve the reliability of EEG interpretation.

FREE ARTICLE

ORGANITZACIÓ I ENTRENAMENT

1. Int J Environ Res Public Health. 2019 Mar 3;16(5). pii: E766. doi: 10.3390/ijerph16050766.

Acquisition of Knowledge and Practical Skills after a Brief Course of BLS-AED in First-Year Students in Nursing and Physiotherapy at a Spanish University.

Méndez-Martínez C(1), Martínez-Isasi S(2), García-Suárez M(3), Peña-Rodríguez MA(4), Gómez-Salgado J(5)(6), Fernández-García D(7).

Abstract

Out-of-hospital cardiorespiratory arrest is one of the leading causes of death in the Western world. Early assistance with quality Cardiopulmonary Resuscitation (CPR) and the use of a defibrillator may increase the percentage of survival after this process. The objective of this study was to evaluate the effect of CPR training and the management of an Automatic External Defibrillator (AED). A descriptive, cross-sectional, observational study was carried out among students in the first year of a Nursing and Physiotherapy degree of the University of León. To achieve this goal, a theoretical-practical educational intervention of four hours' duration which included training on CPR, AED and Basic Life Support (BLS) was carried out. A total of 112 students were included. The results showed an increase in theoretical knowledge on BLS as well as on CPR and AED, and practical skills in CPR and AED management. A theoretical exposition of fifteen minutes and the practical training of CPR wasenough for the students to acquire the necessary theoretical knowledge, although the participants failed to reach quality criteria in CPR. Only 35.6% of students reached the right depth in compressions. Also, ventilation was not performed properly. Based on the results, we cannot determine that the percentage of overall quality of CPR was appropriate, since 57.6% was obtained in this respect and experts establish a value higher than 70% for quality CPR. There was a clear relationship between sex, weight, height and body max index (BMI), and quality CPR performance, being determinant variables to achieve quality parameters. Currently, Basic Life Support training in most universities is based

on training methods similar to those used in the action described. The results obtained suggest implementing other training methods that favour the acquisition of quality CPR skills.

FREE ARTICLE

2. BMC Med Educ. 2019 Mar 1;19(1):67. doi: 10.1186/s12909-019-1500-7.

Learning by teaching basic life support: a non-randomized controlled trial with medical students.

Veloso SG(1), Pereira GS(2), Vasconcelos NN(2), Senger MH(3), de Faria RMD(4).

Abstract

BACKGROUND: Cardiopulmonary resuscitation is usually taught in universities through theoretical lectures and simulations on mannequins with low retention of knowledge and skills. New teaching methodologies have been used to improve the learning, placing the student at the center of the process. Likewise, the outside community knows next to nothing about cardiopulmonary resuscitation. Patients who have an out-of-hospital cardiac arrest will die if the effective maneuvers are not promptly done. Learning by teaching could be a way to answer both requirements. It was therefore decided to evaluate whether the medical students' cardiopulmonary resuscitation performance would improve when they teach other people, and if those people could learn with them effectively.

METHODS: A non-randomized controlled trial was designed to assess whether teaching Basic Life Support would increase students' learning. Socially engaged, seeking to disseminate knowledge, 92 medical students were trained in Basic Life Support and who subsequently trained 240 community health professionals. The students performed theoretical and practical pre- and post-tests whereas the health professionals performed theoretical pre- and post-tests and one practical test. In order to assess the impact of teaching on students' learning, they were divided into two groups: a case group, with 53 students, reassessed after teaching health professionals, and a control group, with 39 students, reassessed before teaching.

RESULTS: The practical students' performance of the case group went from 13.3 ± 2.1 to 15.3 ± 1.2 (maximum = 17, $p < 0.001$) and theoretical from 10.1 ± 3.0 to 16.4 ± 1.7 (maximum = 20, $p < 0.001$) while the performance of the control group went from 14.4 ± 1.6 to 14.4 ± 1.4 ($p = 0.877$) and from 11.2 ± 2.6 to 15.0 ± 2.3 ($p < 0.001$), respectively. The theoretical performance of the health professionals changed from 7.9 ± 3.6 to 13.3 ± 3.2 ($p < 0.001$) and the practical performance was 11.7 ± 3.2.

CONCLUSIONS: The students who passed through the teaching activity had a theoretical and practical performance superior to that of the control group. The community was able to learn from the students. The study demonstrated that the didactic activity can be an effective methodology of learning, besides allowing the dissemination of knowledge. The University, going beyond its academic boundaries, performs its social responsibility.

FREE ARTICLE

CURES POST-RCE

1. Prehosp Emerg Care. 2018 Mar-Apr;22(2):208-213. doi: 10.1080/10903127.2017.1362086. Epub 2017 Sep 14.

Challenges of Using Probabilistic Linkage Methodology to Characterize Post-Cardiac Arrest Care in Michigan.

Swor R, Qu L, Putman K, Sawyer KN, Domeier R, Fowler J, Fales W.

Abstract:

BACKGROUND: To improve survival of patients resuscitated from out of hospital cardiac arrest (OCHA), data is needed to assess and improve inpatient post-resuscitation care. Our objective was to apply probabilistic linkage methodology to link EMS and inpatient databases and evaluate whether it may be used to describe post-arrest care in Michigan.

METHODS: We performed a retrospective study to describe post-cardiac arrest care in adult OHCA patients who were transported to Michigan hospitals from July 1, 2010, to June 30, 2013. Using probabilistic linkage methodology we linked two databases, the Michigan EMS Information System (MI_EMSIS) and the Michigan Inpatient Database (MIDB), which describes inpatient care and outcome of all admissions. Rates of case incidence and survival were compared to published literature. We compared the linked dataset to existing cardiac arrest databases from three counties to evaluate the quality of this linkage.

RESULTS: Multiple iterations of match strategies were used to create a linked EMS-inpatient dataset. There were 12,838 MI_EMSIS cardiac arrest records of which 1,977 were matched with MIDB records, identifying them as surviving to hospital admission. Of these 590 (30.0%) survived to hospital discharge. The annual survival incidence/100,000 population to admission was 6.93/100,000 and survival incidence to discharge was 2.1/100,000. The matched dataset was compared to county databases identified a limited sensitivity [48.2%, 95% CI 42.1%-55.3%)] and positive predictive value [64.4%, 95% CI 56.8%-71.3%)].

CONCLUSION: Use of the MI_EMSISEMS database and the Michigan Inpatient database was feasible and produced rates of cardiac arrest admission and survival rates similar to published literature. This process yielded a limited match compared to existing county cardiac arrest databases. We conclude that such a linked dataset is useful for descriptive purposes but not as a population based dataset to evaluate statewide post-cardiac arrest care.

TARGETED TEMPERATURE MANAGEMENT

1. J Crit Care. 2019 Feb 20;51:170-174. doi: 10.1016/j.jcrc.2019.02.024. [Epub ahead of print]

Usefulness of a quantitative analysis of the cerebrospinal fluid volume proportion in brain computed tomography for predicting neurological prognosis in cardiac arrest survivors who undergo target temperature management.

You YH(1), Park JS(2), Yoo IS(3), Min JH(1), Jeong WJ(1), Cho YC(1), Ryu S(1), Lee JW(1), Kim SW(3), Cho SU(1), Oh SK(1), Ahn HJ(1), In YN(4), Kwack CH(4), Yi KS(5), Lee DH(6), Lee BK(6), Park KH(7), Lee IH(8), Kim SM(9), Kwon IS(10).

Abstract

PURPOSE: Brain swelling post-cardiac arrest may affect cerebrospinal fluid volume. We aimed to investigate the prognostic performance of the proportion of cerebrospinal fluid volume (pCSFV) using brain computed tomography (CT) in cardiac arrest survivors.

MATERIALS AND METHODS: This retrospective multicentre study included adult comatose cardiac arrest survivors who underwent brain CT scan prior to target temperature management (TTM) from 2015 to 2016. Grey-to-white matter ratio (GWR) and pCSFV values were calculated. pCSFV analysis was performed using automated quantitative analysis programming. The primary outcome was a 6-month neurological outcome.

RESULTS: Of 251 patients (median age, 57 years), 173 (68.9%) were male, 87 (34.7%) had a shockable rhythm, and 160 (63.7%) had unfavourable neurological outcomes. GWR but not pCSFV was significantly higher in terms of favourable neurological outcomes (p = .015). pCSFV prognostic performances were similar to GWR, and were poor overall, (0.521; 95% confidence interval [CI], 0.446-0.694 vs. 0.515; 95% CI, 0.441-0.589). After adjusting for covariates, pCSFV but not GWR was independently associated with neurological outcome 6 months following cardiac arrest (p = .049).

CONCLUSION: pCSFV was independently associated with neurological outcome 6 months following cardiac arrest, however prognostic performance was not good.

ELECTROPHYSIOLOGY AND DEFIBRILLATION

1. Heart. 2018 Dec;104(23):1929-1936. doi: 10.1136/heartjnl-2017-312622. Epub 2018 Jun 14.

Different defibrillation strategies in survivors after out-of-hospital cardiac arrest.

Zijlstra JA(1), Koster RW(1), Blom MT(1), Lippert FK(2), Svensson L(3), Herlitz (4), Kramer-Johansen J(5), Ringh M(3), Rosenqvist M(6), Palsgaard Møller T(2), Tan HL(1), Beesems SG(1), Hulleman M(1), Claesson A(3), Folke F(2), Olasveengen TM(5), Wissenberg M(7), Hansen CM(7), Viereck S(2), Hollenberg J(3); COSTA study group.

Abstract

BACKGROUND: In the last decade, there has been a rapid increase in the dissemination of automated external defibrillators (AEDs) for prehospital defibrillation of out-of-hospital cardiac arrest patients. The aim of this study was to study the association between different defibrillation strategies on survival rates over time in Copenhagen, Stockholm, Western Sweden and Amsterdam, and the hypothesis was that non-EMS defibrillation increased over time and was associated with increased survival.

METHODS: We performed a retrospective analysis of four prospectively collected cohorts of out-of-hospital cardiac arrest patients between 2008 and 2013. Emergency medical service (EMS)-witnessed arrests were excluded.

RESULTS: A total of 22 453 out-of-hospital cardiac arrest patients with known survival status were identified, of whom 2957 (13%) survived at least 30 days postresuscitation. Of all survivors with a known defibrillation status, 2289 (81%) were defibrillated, 1349 (59%) were defibrillated by EMS, 454 (20%) were defibrillated by a first responder AED and 429 (19%) were defibrillated by an onsite AED and 57 (2%) were unknown. The percentage of survivors defibrillated by first responder AEDs (from 13% in 2008 to 26% in 2013, $p<0.001$ for trend) and onsite AEDs (from 14% in 2008 to 30% in 2013, $p<0.001$ for trend) increased. The increased use of these non-EMS AEDs was associated with the increase in survival rate of patients with a shockable initial rhythm.

CONCLUSION: Survivors of out-of-hospital cardiac arrest are increasingly defibrillated by non-EMS AEDs. This increase is primarily due to a large increase in the use of onsite AEDs as well as an increase in first-responder defibrillation over time. Non-EMS defibrillation accounted for at least part of the increase in survival rate of patients with a shockable initial rhythm.

3. J Formos Med Assoc. 2019 Jan;118(1 Pt 1):148-151. doi: 10.1016/j.jfma.2018.02.006. Epub 2018 Mar 24.

The utilization of automated external defibrillators in Taiwan.

Wang TH(1), Wu HW(2), Hou PC(3), Tseng HJ(4).

Abstract:

BACKGROUND: Increasing attention to care of patient succumbed to out-of-hospital cardiac arrest (OHCA) and evidence for improved survival have resulted in many countries to encourage the use automated external defibrillators (AEDs) by legislation. In Taiwan, the amendment of the Emergency Medical Services Act mandated the installation of AEDs in designated areas in 2013. Since then, 6151 AEDs have been installed and registered in mandated and non-mandated locations. The purpose of this study was to investigate the utilization of AEDs at mandated and non-mandated locations.

METHODS: This paper analyzed 217 cases in whom AEDs was used between July 11, 2013 and July 31, 2015. Descriptive statistics were used to analyze the data.

RESULTS: The highest frequency of AEDs used was in long-term care facilities, accounting for 34 (15.7%) cases. The second and third highest was in schools and commuting stations. The highest utilization rate of registered AED was in long-term care facilities (73.9%), the second was in residential areas, and the third was in hot spring areas. Employees at the designated locations or medical personnel operated the AED in 143 cases (84.6%), and bystanders, relatives, friends or others operated the AEDs in 26 cases (15.4%). On-site Return of Spontaneous Circulation (ROSC) after applying AEDs occurred in 76 cases (45.8%).

CONCLUSION: Long-term care facilities had the highest utilization of AEDs and government should pay more attention to enforce the installing of AEDs in these places. The government also needs to promote the education public on how to search the AEDs locations.

PEDIATRIA

1. Pediatr Crit Care Med. 2019 Mar;20(3):293-294. doi: 10.1097/PCC.0000000000001856.

Pediatric In-Hospital Cardiac Arrest-Can We Do Better?

Pessach IM(1), Paret G.

NO ABSTRACT

RECERCA EXPERIMENTAL

1. Neuroscience. 2018 Nov 21;393:24-32. doi: 10.1016/j.neuroscience.2018.09.041. Epub 2018 Oct 6.

Inhibiting Succinate Dehydrogenase by Dimethyl Malonate Alleviates Brain Damage in a Rat Model of Cardiac Arrest.

Xu J(1), Pan H(2), Xie X(3), Zhang J(4), Wang Y(1), Yang G(5).

Abstract

Brain damage is a leading cause of death in patients with cardiac arrest (CA). The accumulation of succinate during ischemia by succinate dehydrogenase (SDH) is an important mechanism of ischemia-reperfusion injury. It was unclear whether inhibiting the oxidation of accumulated succinate could also mitigate brain damage after CA. In this study, rats were subjected to a 6 min of CA, and cardiopulmonary resuscitation (CPR) was performed with administration of normal saline or dimethyl malonate (DMM, a competitive inhibitor of SDH). After the return of spontaneous circulation, neurological function of the rats was assessed by a tape removal test for 3 days. The rats were then sacrificed, and their brains were used to assess neuronal apoptosis by terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) assay. Hippocampal tissues were used for Western blotting analysis and biochemical detection. In addition, hippocampal mitochondria during CA and CPR were isolated. The relative mitochondrial membrane potential (MMP) and cytochrome C in the cytosol were detected. Our results show that DMM promoted ROSC and neurological performance in rats after CA. The TUNEL assay showed that DMM reduced neuronal apoptosis. Western blotting analysis showed that DMM inhibited the activation of caspase-3 and enhanced the expression of HIF-1α. Moreover, DMM inhibited excessive hyperpolarization of MMP after CPR, and prevented the release of cytochrome C. Therefore, inhibiting SDH by DMM alleviated brain damage after CA, and the main mechanisms included inhibiting the excessive hyperpolarization of MMP, reducing the generation of mtROS and stabilizing the structure of HIF-1α.

2. Prehosp Emerg Care. 2018 Mar-Apr;22(2):266-275. doi: 10.1080/10903127.2017.1358782. Epub 2017 Sep 14.

Sternal Route More Effective than Tibial Route for Intraosseous Amiodarone Administration in a Swine Model of Ventricular Fibrillation.

Burgert JM, Martinez A, O'Sullivan M, Blouin D, Long A, Johnson AD.

Abstract

OBJECTIVE: The pharmacokinetics of IO administered lipid soluble amiodarone during ventricular fibrillation (VF) with ongoing CPR are unknown. This study measured mean plasma concentration over 5 minutes, maximum plasma concentration (Cmax), and time to maximum concentration (Tmax) of amiodarone administered by the sternal IO (SIO), tibial IO (TIO), and IV routes in a swine model of VF with ongoing CPR.

METHODS: Twenty-one Yorkshire-cross swine were randomly assigned to three groups: SIO, TIO, and IV. Ventricular fibrillation was induced under general anesthesia. After 4 minutes in VF, 300 mg amiodarone was administered as indicated by group assignment. Serial blood specimens collected at 30, 60, 90, 120, 150, 180, 240, and 300 seconds were analyzed using high performance liquid chromatography with tandem mass spectrometry.

RESULTS: The mean plasma concentration of IV amiodarone over 5 minutes was significantly higher than the TIO group at 60 seconds (P = 0.02) and 90 seconds (P = 0.017) post-injection. No significant differences in Cmax between the groups were found (P <0.05). The Tmax of amiodarone was significantly shorter in the SIO (99 secs) and IV (86 secs) groups compared to the TIO group (215 secs); P = 0.002 and P = 0.002, respectively.

CONCLUSIONS: The SIO and IV routes of amiodarone administration were comparable. The TIO group took nearly three times longer to reach Tmax than the SIO and IV groups, likely indicating depot of lipid-soluble amiodarone in adipose-rich tibial yellow bone marrow. The SIO route was more effective than the TIO route for amiodarone delivery in a swine model of VF with ongoing CPR. Further investigations are necessary to determine if the kinetic differences found between the SIO and TIO routes in this study affect survival of VF in humans.

3. Resuscitation. 2019 Feb 28. pii: S0300-9572(19)30045-0. doi: 10.1016/j.resuscitation.2019.02.026. [Epub ahead of print]

Mechanism and extent of myocardial injury associated with out-of-hospital cardiac arrest.

Berden J(1), Steblovnik K(1), Noc M(2).

Abstract

AIM: We investigated the mechanism and extent of myocardial injury associated with out-of-hospital cardiac arrest (OHCA).

METHODS: 159 consecutive patients undergoing immediate coronary angiography after OHCA were included and divided into groups with acute culprit lesion (A), stable obstructive coronary disease (B) and non-obstructive or absent coronary disease (C). Post-resuscitation electrocardiogram (ECG) and serial measurements of high sensitivity cardiac troponin I (cTnI) were compared.

RESULTS: ST-elevation myocardial infarction (STEMI) was documented in 65% in group A, 26% in group B, and 11% in group C (p < 0.001). cTnI, which was 0.88 ng/mL, 0.44 ng/mL and 0.19 ng/mL in groups A, B and C on admission (p < 0.001), increased to a maximum of 63.96 ng/mL, 10.00 ng/mL and 2.35 ng/mL, respectively (p < 0.001). Within the group A, cTnI was significantly larger in patients with acute occlusion than in patients with spontaneous reperfusion at initial angiography. Within groups B and C, peak cTnI correlated with duration of resuscitation, number of defibrillations and cumulative adrenaline (epinephrine) dose. If admission cTnI exceeded 0.46 ng/mL and STEMI was present in ECG, sensitivity for detection of acute culprit lesion was 88% and specificity 54%.

CONCLUSIONS: Significant myocardial injury associated with OHCA occurs in the presence of acute culprit lesion while extent of myocardial injury in stable or absent coronary disease is significantly smaller and correlates with the duration and intensity of cardiac resuscitation. Admission cTnI, although combined with post-resuscitation ECG, have insufficient accuracy to securely predict presence of acute culprit lesion.

4. J Biol Chem. 2018 Aug 31;293(35):13650-13661. doi: 10.1074/jbc.RA118.003760. Epub 2018 Jul 9.

The cardiac ryanodine receptor, but not sarcoplasmic reticulum Ca^{2+}-ATPase, is a major determinant of Ca^{2+} alternans in intact mouse hearts.

Sun B(1), Wei J(1), Zhong X(1), Guo W(1), Yao J(1), Wang R(1), Vallmitjana A(2), Benitez R(2), Hove-Madsen L(3), Chen SRW(4).

Abstract

Sarcoplasmic reticulum (SR) Ca^{2+} cycling is governed by the cardiac ryanodine receptor (RyR2) and SR Ca^{2+}-ATPase (SERCA2a). Abnormal SR Ca^{2+} cycling is thought to be the primary cause of Ca^{2+} alternans that can elicit ventricular arrhythmias and sudden cardiac arrest. Although alterations in either RyR2 or SERCA2a function are expected to affect SR Ca^{2+} cycling, whether and to what extent altered RyR2 or SERCA2a function affects Ca^{2+} alternans is unclear. Here, we employed a gain-of-function RyR2 variant (R4496C) and the phospholamban-knockout (PLB-KO) mouse model to assess the effect of genetically enhanced RyR2 or SERCA2a function on Ca^{2+} alternans. Confocal Ca^{2+} imaging revealed that RyR2-R4496C shortened SR Ca^{2+} release refractoriness and markedly suppressed rapid pacing-induced Ca^{2+} alternans. Interestingly, despite enhancing RyR2 function, intact RyR2-R4496C hearts exhibited no detectable spontaneous SR Ca^{2+} release events during pacing. Unlike for RyR2, enhancing SERCA2a function by ablating PLB exerted a relatively minor effect on Ca^{2+} alternans in intact hearts expressing RyR2 WT or a loss-of-function RyR2 variant, E4872Q, that promotes Ca^{2+} alternans. Furthermore, partial SERCA2a inhibition with 3 μm 2,5-di-*tert*-butylhydroquinone (tBHQ) also had little impact on Ca^{2+} alternans, whereas strong SERCA2a inhibition with 10 μm tBHQ markedly reduced the amplitude of Ca^{2+} transients and suppressed Ca^{2+} alternans in intact hearts. Our results demonstrate that enhanced RyR2 function suppresses Ca^{2+} alternans in the absence of spontaneous Ca^{2+} release and that RyR2, but not SERCA2a, is a key determinant of Ca^{2+} alternans in intact working hearts, making RyR2 an important therapeutic target for cardiac alternans.

6. Circ Genom Precis Med. 2018 Jan;11(1):e001758. doi: 10.1161/CIRCGEN.117.001758.

ExomeChip-Wide Analysis of 95 626 Individuals Identifies 10 Novel Loci Associated With QT and JT Intervals.

Bihlmeyer NA1, Brody JA1, Smith AV1, Warren HR1, Lin H1, Isaacs A1, Liu CT1, Marten J1, Radmanesh F1, Hall LM1, Grarup N1, Mei H1, Müller-Nurasyid M1, Huffman JE1, Verweij N1, Guo X1, Yao J1, Li-Gao R1, van den Berg M1, Weiss S1, Prins BP1, van Setten J1, Haessler J1, Lyytikäinen LP1, Li M1, Alonso A1, Soliman EZ1, Bis JC1, Austin T1, Chen YI1, Psaty BM1, Harrris TB1, Launer LJ1, Padmanabhan S1, Dominiczak A1, Huang PL1, Xie Z1, Ellinor PT1, Kors JA1, Campbell A1, Murray AD1, Nelson CP1, Tobin MD1, Bork-Jensen J1, Hansen T1, Pedersen O1, Linneberg A1, Sinner MF1, Peters A1, Waldenberger M1, Meitinger T1, Perz S1, Kolcic I1, Rudan I1, de Boer RA1, van der Meer P1, Lin HJ1, Taylor KD1, de Mutsert R1, Trompet S1, Jukema JW1, Maan AC1, Stricker BHC1, Rivadeneira F1, Uitterlinden A1, Völker U1, Homuth G1, Völzke H1, Felix SB1, Mangino M1, Spector TD1, Bots ML1, Perez M1, Raitakari OT1, Kähönen M1, Mononen N1, Gudnason V1, Munroe PB1, Lubitz SA1, van Duijn CM1, Newton-Cheh CH1, Hayward C1, Rosand J1, Samani NJ1, Kanters JK1, Wilson JG1, Kääb S1, Polasek O1,

van der Harst P1, Heckbert SR1, Rotter JI1, Mook-Kanamori DO1, Eijgelsheim M1, Dörr M1, Jamshidi Y1, Asselbergs FW1, Kooperberg C1, Lehtimäki T1, Arking DE1, Sotoodehnia N1.

Erratum in Circ Genom Precis Med. 2018 Sep;11(9):e000050.

Comment in Circ Genom Precis Med. 2018 Jan;11(1):e002007.

Abstract

BACKGROUND: QT interval, measured through a standard ECG, captures the time it takes for the cardiac ventricles to depolarize and repolarize. JT interval is the component of the QT interval that reflects ventricular repolarization alone. Prolonged QT interval has been linked to higher risk of sudden cardiac arrest.

METHODS AND RESULTS: We performed an ExomeChip-wide analysis for both QT and JT intervals, including 209 449 variants, both common and rare, in 17 341 genes from the Illumina Infinium HumanExome BeadChip. We identified 10 loci that modulate QT and JT interval duration that have not been previously reported in the literature using single-variant statistical models in a meta-analysis of 95 626 individuals from 23 cohorts (comprised 83 884 European ancestry individuals, 9610 blacks, 1382 Hispanics, and 750 Asians). This brings the total number of ventricular repolarization associated loci to 45. In addition, our approach of using coding variants has highlighted the role of 17 specific genes for involvement in ventricular repolarization, 7 of which are in novel loci.

CONCLUSIONS: Our analyses show a role for myocyte internal structure and interconnections in modulating QT interval duration, adding to previous known roles of potassium, sodium, and calcium ion regulation, as well as autonomic control. We anticipate that these discoveries will open new paths to the goal of making novel remedies for the prevention of lethal ventricular arrhythmias and sudden cardiac arrest

FREE ARTICLE

CASE REPORTS

1 Pediatr Emerg Care. 2019 Feb 26. doi: 10.1097/PEC.0000000000001766. [Epub ahead of print]

Epinephrine at 25°C Core Body Temperature and During Rewarming: Case Report of Successful Infant Resuscitation After Cold Water Submersion.

Mann C(1), Baer W, Riedel T.

Abstract

Epinephrine plays a controversial role in accidental hypothermia (<30°C). We report its use in the advanced life support of a 13-month-old white girl with pulseless electrical activity and 25°C core body temperature after 32 minutes of submersion in a fast-running Swiss mountain stream at 8°C. Two doses of epinephrine (10 μg/kg) were given in the field, followed by 12 doses (10 μg/kg) and an infusion of 0.1 μg/kg per minute during rewarming. Spontaneous circulation returned at 29.5°C after 2.5 hours of cardiopulmonary resuscitation. Neurologic long-term outcome was excellent. We conclude that in the presence of nonshockable rhythm the benefits of epinephrine may outweigh the risks of side effects when used in pediatric advanced life support for accidental hypothermia.This is an open-access article distributed under