RCP / COMPRESSIONS TORÀCIQUES MECÀNIQUES

The Maximum Diameter of the Left Ventricle May Not Be the Optimum Target for Chest Compression During Cardiopulmonary Resuscitation: A Preliminary, Observational Study Challenging the Traditional Assumption.

Park GY(1), Oh WS(2), Chon SB(3), Kim S(1).

Abstract

OBJECTIVE: Researchers have assumed that compressing the point beneath which the left ventricle (LV) diameter is maximum (P_max.LV) would improve cardiopulmonary resuscitation outcomes. Defining the midsternum, the currently recommended location for chest compression, as the reference (x = 0), the lateral deviation (x_max.LV) of personalized P_max.LV has become estimable using posteroanterior chest radiography. The authors investigated whether out-of-hospital cardiac arrest (OHCA) patients, whose x_max.LV was closer to the midsternum and thus had their P_max.LV compressed closer during cardiopulmonary resuscitation, showed better chances of return of spontaneous circulation (ROSC) and survival to discharge. DESIGN: Retrospective, cross-sectional study. SETTING: A university hospital. PARTICIPANTS: Adult OHCA patients with available previous posteroanterior chest radiography. INTERVENTION: None. MEASUREMENTS AND MAIN RESULTS:

For each clinical outcome, multivariable logistic regression was performed, grouping x_max.LV into tertiles and adjusting the variables selected among the core elements of the Utstein template showing possible differences ($p > 0.10$) in univariate analysis. Odds ratios were presented as OR (95% confidence interval). Among 268 cases (age 64.4 ± 15.8 y, female 89 [33.2%]), 123 (45.9%) achieved ROSC and 40 (14.9%) survival to discharge. Compared with the third tertile of x_max.LV (59 to ~101 mm), the first (31 to ~48 mm) and second (48 to ~59 mm) tertiles, which had a P_max.LV closer to the midsternum, were negatively associated with ROSC (OR 0.502 [0.262-0.960]; p = 0.037 and OR 0.442 [0.233-0.837]; p = 0.012, respectively) and survival to discharge (OR 0.286 [0.080-1.03]; p = 0.055 and OR 0.046 [0.007-0.308]; p = 0.002, respectively). CONCLUSIONS: OHCA patients with a P_max.LV located closer to the midsternum showed worse chances of ROSC and survival to discharge, which challenges the traditional assumption of identifying P_max.LV as the optimum compression point.

Study Monitoring in Emergency Care Trials: Lessons from the Resuscitation Outcomes Consortium Continuous Chest Compressions Trial.

[Schmicker RH](#)[1], [Nichol G](#)[2], [Callaway CW](#)[3], [Cheskes S](#)[4], [Sopko G](#)[5], [Wang HE](#)[6].

Abstract

OBJECTIVE: Clinical trial investigators often assemble internal study monitoring committees (SMCs) to measure individual or group adherence with trial performance benchmarks. We examined the processes and results of study monitoring in an international trial of out-of-hospital cardiac arrest. METHODS: We studied SMC operations for the Resuscitation Outcomes Consortium (ROC) Continuous Chest Compressions (CCC) trial, which compared continuous with interrupted chest compressions upon survival after out-of-hospital cardiac arrest. The SMC defined trial performance benchmarks, which included compliance with the intervention, cardiopulmonary resuscitation (CPR) process data availability and timely data completion. Trial investigators received monthly performance reports. We determined rates of trial noncompliance and suspension from the trial. RESULTS: ROC-CCC enrolled a total of 23,711 subjects in the primary analysis population. Across 113 enrolling agencies, the SMC monitored performance for a total 2,367 agency-months. Emergency medical services agencies were on probation for a total of 178 (7.5%) agency-months. Fifty-five agencies were placed on probation at least once, of which 78% improved their performance and were approved for continued participation in the trial. A total of 12 agencies were suspended from trial participation. Data monitoring resulted in high-quality CPR (mean chest

compression fraction = 0.80), 87% CPR process availability and timely data completion (75th and 95th percentiles prehospital data = 22 and 57 days; hospital data = 58 and 118 days). CONCLUSIONS: Study monitoring procedures may play an important role in ensuring the performance quality in acute care clinical trials.

Chest-compression-only after drowning: a call for more research.

Handley AJ[1].

NO ABSTRACT AVAILABLE

ACR INTRAHOSPITALÀRIA

Early termination of resuscitation in in-hospital cardiac arrest and impact to the outcome calculations.

Loisa E[1,2], Setälä P[2,3], Hoppu S[2,3], Tirkkonen J[2,4].

Abstract

BACKGROUND: Some in-hospital resuscitation attempts are assessed futile and terminated early on. We hypothesized that if these cases are reported separately, the true outcome of in-hospital cardiac arrest is better reflected. METHODS: We conducted a 3-year prospective observational Utstein-style study in Tampere, Finland. All adult in-hospital cardiac arrests outside critical care areas attended by hospital's rapid response team were included. Resuscitation attempts that were terminated within 10 minutes were considered early terminations. RESULTS: The cohort consisted of 199 in-hospital cardiac arrest patients. Twenty-seven (14%) resuscitation attempts were terminated early due to the presumed futility of the attempt with median resuscitation duration of 5 (4, 7) minutes. These cases and the 172 patients with full resuscitation attempt were of comparable age, sex and comorbidity. Early terminated resuscitation attempts were more often unwitnessed (63% vs. 10%, P < .001) with initial non-shockable rhythm (100% vs. 80%, P = .006) when compared with full attempts. The most frequently reported reasons for termination decisions were non-witnessed arrest presenting asystole as initial rhythm and severe acute illness. The hospital survival with good neurological outcome and 1-year survival were 30% and 25% for the whole cohort, and 34% and 29% when early terminated resuscitation attempts were excluded.

CONCLUSION: One-seventh of resuscitation attempts were terminated early on due to presumed futility of the attempt. Short- and long-term outcomes were 5% and 4% better when early terminated attempts were excluded from the outcome analyses. We believe that in-hospital cardiac arrest outcome is not as poor as repeatedly presented in the literature.

CAUSES DE L'ACR

Association Between Multivessel Coronary Artery Disease and Return of Spontaneous Circulation Interval in Acute Coronary Syndrome Patients with Out-of-Hospital Cardiac Arrest.

Tateishi K(1), Abe D(2), Suzuki K(2), Hamabe Y(3), Aonuma K(4), Sato A(4).

Abstract

Acute coronary syndrome (ACS) is the major cause of out-of-hospital cardiac arrest (OHCA). The relationship between the findings from the study of coronary images and return of spontaneous circulation (ROSC) interval is still unknown. Hence, we investigated this relationship in ACS patients with OHCA. A cohort of 2779 patients was admitted to our emergency center due to cardiopulmonary arrest (CPA) between April 2011 and March 2015. We included ACS patients who had CPA with ventricular fibrillation (VF) as an initial rhythm, were successfully resuscitated, underwent coronary angiography (CAG), had a culprit lesion, and were diagnosed with ACS (n = 58; age, 63.7 ± 12.0 years; 93.1% male).We divided the 58 patients into two groups, an early ROSC group (ROSC ≤ 20 minutes: E-ROSC) and a late ROSC group (ROSC > 20 minutes: L-ROSC), and then analyzed their characteristics.The finding of a collateral artery for the culprit lesion location, Rentrop II-III, and TIMI III flow on CAG on arrival presented no significant differences between the two groups (Rentrop II-III: 25.0% versus 23.5%, P = 0.90; TIMI III: 33.3% versus 35.3%, P = 0.88). The incidence of multivessel coronary artery disease (MVD) was lower in the E-ROSC group than in the L-ROSC group (16.7% versus 58.8%, P = 0.001). Collateral and TIMI flow were not associated with ease of resuscitation, but MVD may have a negative impact on resuscitation, especially in VF patients.

FREE FULL TEXT

Effect of a fluid bolus on cardiovascular collapse among critically ill adults undergoing tracheal intubation (PrePARE): a randomised controlled trial.

Janz DR(1), Casey JD(2), Semler MW(2), Russell DW(3), Dargin J(4), Vonderhaar DJ(5), Dischert KM(6), West JR(7), Stempek S(4), Wozniak J(4), Caputo N(7), Heideman BE(2), Zouk AN(3), Gulati S(3), Stigler WS(3), Bentov I(8), Joffe AM(8), Rice TW(2); PrePARE Investigators; Pragmatic Critical Care Research Group.

Abstract

BACKGROUND: Tracheal intubation is common in the care of critically ill adults and is frequently complicated by hypotension, cardiac arrest, or death. We aimed to evaluate administration of an intravenous fluid bolus to prevent cardiovascular collapse during intubation of critically ill adults.

METHODS: We did a pragmatic, multicentre, unblinded, randomised trial in nine sites (eight ICUs and one emergency department) around the USA. Critically ill adults (≥18 years) undergoing tracheal intubation were randomly assigned (1:1, block sizes of 2, 4, and 6, stratified by study site) to either an intravenous infusion of 500 mL of crystalloid solution or no fluid bolus. The primary outcome, assessed in the intention-to-treat population, was cardiovascular collapse, defined as a new systolic blood pressure <65 mm Hg; new or increased vasopressor

receipt between induction and 2 min after tracheal intubation; or cardiac arrest or death within 1 h of tracheal intubation. Adverse events were

assessed in the as-treated population. This trial, which is now complete, is registered with ClinicalTrials.gov, number NCT03026777. FINDINGS: Patients were enrolled from Feb 6, 2017, to Jan 9, 2018, when the data and safety monitoring board stopped the trial on the basis of futility. By trial

termination, 337 (63%) of 537 screened adults had been randomly assigned. Cardiovascular collapse occurred in 33 (20%) of 168 patients in the fluid bolus group compared with 31 (18%) of 169 patients in the no fluid bolus group (absolute difference 1·3% [95% CI -7·1% to 9·7%]; p=0·76). The individual

components of the cardiovascular collapse composite outcome did not differ between groups (new systolic blood pressure <65 mm Hg 11 [7%] in the bolus group vs ten [6%] in the no-bolus group, new or increased vasopressor 32 [19%] vs 31 [18%], cardiac arrest within 1 h seven [4%] vs two [1%], death within 1 h of intubation two [1%] vs one [1%]). In-hospital mortality was not significantly

different in the fluid bolus group (48 [29%]) compared with no fluid bolus (59 [35%]). INTERPRETATION: Administration of an intravenous fluid bolus did not decrease the overall incidence of cardiovascular collapse during tracheal intubation of critically ill adults compared with no fluid bolus in this trial. FUNDING: US National Institutes of Health.

Systematic Meta-Analysis of the Association Between a Common NOS1AP Genetic Polymorphism, the QTc Interval, and Sudden Death.

Zang X(1), Li S(2), Zhao Y(1), Chen K(1), Wang X(1), Song W(1), Ma J(1), Tu X(3), Xia Y(4), Zhang S(5), Gao C(1).

Abstract

Contemporary studies have identified rs10494366 in the nitric oxide synthase 1 adaptor protein (NOS1AP) gene as a new genetic marker in modulating the QT interval and sudden cardiac death (SCD) in general populations. However, the conclusions were not coincident. Therefore, we conducted for the first time a system evaluation of the relativity of rs10494366, the QT interval, and sudden death by meta-analysis. In our study, the meta-analysis displayed the GG genotype of rs10494366 correlated with the QT interval in women with no heterogeneity, and in diabetes mellitus (DM) patients with minor heterogeneity. In the Caucasian population, the correlation of rs10494366 and sudden death was significant. The heterogeneity referred to the relevance between rs10494366 and sudden death in the Asian population. In conclusion, the minor allele of rs10494366 may have an impact on the QT interval in women or DM patients and may have a potential role in sudden death in the Caucasian population.

FREE FULL TEXT

Postmortem ICD interrogation in mode of death classification.

Nikolaidou T(1), Johnson MJ(2), Ghosh JM(3), Marincowitz C(3), Shah S(1), Lammiman MJ(1), Schilling RJ(4), Clark AL(1).

Abstract

BACKGROUND: The definition of sudden death due to arrhythmia relies on the time interval between onset of symptoms and death. However, not all sudden deaths are due to arrhythmia. In patients with an implantable cardioverter defibrillator (ICD), postmortem device interrogation may help better distinguish the mode of death compared to a time-based definition alone. OBJECTIVE: This study aims to assess the proportion of "sudden"

cardiac deaths in patients with an ICD that have confirmed arrhythmia. METHODS: We conducted a literature search for studies using postmortem ICD interrogation and a time-based classification of the mode of death. A modified QUADAS-2 checklist was used to assess risk of bias in individual studies. Outcome data were pooled where sufficient data were available. RESULTS: Our search identified 22 studies undertaken between 1982 and 2015 with 23,600 participants. The pooled results (excluding studies with high risk of bias) suggest that ventricular arrhythmias are present at the time of death in 76% of "sudden" deaths (95% confidence interval [CI] 67-85; range 42-88). CONCLUSION: Postmortem ICD interrogation identifies 24% of "sudden" deaths to be nonarrhythmic. Postmortem device interrogation should be considered in all cases of unexplained sudden cardiac death.

FÀRMACS

Can Systemic Thrombolysis Improve Prognosis of Cardiac Arrest Patients During Cardiopulmonary Resuscitation? A Systematic Review and Meta-Analysis.

Wang Y(1), Wang M(1), Ni Y(1), Liang B(1), Liang Z(1).

Abstract

BACKGROUND: Cardiac arrests are caused in most cases by thromboembolic diseases, such as acute myocardial infarction (AMI) and pulmonary embolism (PE). OBJECTIVE: We aimed to ascertain the associations of thrombolytic therapy with potential benefits among cardiac arrest patients during cardiopulmonary resuscitation (CPR). METHODS: We searched PubMed, Embase, and Cochrane databases for studies that evaluated systemic thrombolysis in cardiac arrest patients. The primary outcome was survival to hospital discharge, and secondary outcomes included return of spontaneous circulation (ROSC), 24-h survival rate, hospital admission rate, and bleeding complications. RESULTS: Nine studies with a total of 4384 cardiac arrest patients were pooled in the meta-analysis, including 1084 patients receiving systemic thrombolysis and 3300 patients receiving traditional treatments. Compared with conventional therapies, the use of systemic thrombolysis did not significantly improve survival to hospital discharge (13.5% vs. 10.8%; risk ratio [RR] 1.13; 95% confidence interval [CI] 0.92-1.39; p = 0.24, I^2 = 35%), ROSC (50.9% vs. 44.3%; RR 1.29; 95% CI 1.00-1.66; p = 0.05, I^2 = 73%), and 24-h survival (28.1% vs. 25.6%; RR 1.25; 95% CI 0.88-1.77; p = 0.22, I^2 = 63%). We observed higher hospital admission rates for patients receiving systemic thrombolysis (43.4% vs. 30.6%; RR 1.53; 95% CI 1.04-2.24; p = 0.03, I^2 = 87%). In addition, higher risk of bleeding was observed in the thrombolysis group (8.8% vs. 5.0%; RR 1.65; 95% CI 1.16-2.35; p = 0.005, I^2 = 7%). CONCLUSIONS: Systemic thrombolysis during CPR did not improve hospital discharge rate, ROSC, and 24-h survival for cardiac arrest patients. Patients receiving thrombolytic therapy have a higher risk of bleeding. More high-quality studies are needed to confirm our results.

Anticoagulation therapy could improve the restoration of sinus rhythm and spontaneous circulation in hospital patients with CPR.

Wang H(1), Bai ZH(1), Lv JH(1), Sun JL(1), Shi Y(1), Pei HH(1), Zhang ZL(1).

NO ABSTRACT AVAILABLE

ORGANITZACIÓ I TRACTAMENT

Impact of type of emergency department on the outcome of out-of-hospital cardiac arrest: a prospective cohort study.

Kaneda K(1), Yagi T(1), Todani M(1), Nakahara T(1), Fujita M(1), Kawamura Y(1), Oda Y(1), Tsuruta R(1).

Abstract

Aim: To assess whether the outcomes of out-of-hospital cardiac arrest (OHCA) differ between patients treated at tertiary or secondary emergency medical facilities. Methods: Data from the Japanese Association for Acute Medicine Out-of-Hospital Cardiac Arrest (JAAM-OHCA) registry between June 2014 and December 2015 were analyzed and compared between patients treated at tertiary (tertiary group) and secondary (secondary group) emergency medical facilities. The primary outcome of this study was a favorable neurological outcome at 1 and 3 months after OHCA, defined as a Glasgow-Pittsburgh cerebral performance category of 1 or 2. Results: Between June 2014 and December 2015, a total of 13,491 patients with OHCA were registered in the JAAM-OHCA registry. Of these, 12,836 were eligible in the present analysis, with 11,583 in the tertiary group and 1,253 in the secondary group. The proportions of patients with favorable neurological outcomes in the tertiary group were significantly higher than those in the secondary group at 1 (4.7% versus 2.0%, $P < 0.001$) and 3 (3.5% versus 1.6%, $P < 0.001$) months after OHCA. Even after adjusting for baseline characteristics of patients, treatment at a tertiary emergency medical facility was independently associated with favorable neurological outcomes at 1 (odds ratio, 2.856, 95% confidence interval, 1.429-5.710; $P = 0.003$) and 3 (odds ratio, 2.462, 95% confidence interval, 1.203-5.042; $P = 0.014$) months after OHCA. Conclusion: The neurological outcomes of patients with OHCA treated at tertiary emergency medical facilities were better than those of patients treated at secondary emergency medical facilities.

FREE FULL TEXT

Use of a Motorlance to Deliver Emergency Medical Services; a Prospective Cross Sectional Study.

Apiratwarakul K(1)(2), Ienghong K(1), Mitsungnern T(1), Kotruchin P(1), Phungoen P(1), Bhudhisawasdi V(1).

Abstract

INTRODUCTION: Access time to patients with critical or emergent situations outside the hospital is a critical factor that affects both severity of injury and survival. This study aimed to compare the access time to the scene of an emergency situation between a traditional ambulance and motorlance. METHODS:
This prospective cross sectional study was conducted on all users of emergency call, Srinagarind Hospital, Thailand, from June to December 2018, who received a registration number from the command center. RESULTS:
504 emergency-service operations were examined over a six-month period, 252 (50%) of which were carried out by motorlance. The mean activation time for motorlance and ambulance were 0.57 ± 0.22 minutes and 1.11 ± 0.18 minutes, respectively (p<0.001). Mean response time for motorlance was significantly lower (5.57 ± 1.21 versus 7.29 ± 1.32 minutes; p < 0.001). The response times during 6 a.m. to 6 p.m. were 5.26 ± 1.11 minutes for motorlance and 7.15 ± 1.39 minutes for ambulance (p < 0.001). These measures for night time (6 p.m. to 6 a.m.) were 5.58 ± 1.21 minutes and 8.01 ± 1.30 minutes, respectively (p < 0.001). The mean automated external defibrillator (AED) waiting time for motorlance and ambulance were 5.26 ± 2.36 minutes and 9.24 ± 3.30 minutes, respectively (p = 0.012). The survival rate of patients after AED use in motorlance and ambulance was 80% versus 37.5%; p<0.001.

CONCLUSION: Emergency service delivery by motorlance had lower mean activation time, response time, AED time, and mortality rate of cardiac arrest patients compared to ambulance. It seems that motorlance could be considered as an effective and applicable device in emergency medical service delivery, especially in crowded cities with heavy traffic.

To enhance the quality of CPR performed by youth layman.

Abelsson A(1), Nygårdh A(2).

Abstract

BACKGROUND: By educating laymen, survival after cardiac arrest can increase in society. It is difficult to reach the entire population with cardiopulmonary resuscitation (CPR) training. However, if 15% of the population knows how to perform CPR, an increase in short- and long-term survival in patients suffering a cardiac arrest could be seen. To educate youth is a way to reach parts of the population. This study aimed to investigate the effect of a 2-h CPR intervention for youth. METHODS: Data were collected through an intervention utilizing simulation and consisted of a pre- and post-assessment of 50 participants' CPR performance. RESULTS: The participants' compression depths are, after training, within guidelines. However, the compression rate increases from within limits (117) to become too fast (128). The range of the minimum compression rate rises from 70 to 92 which is an improvement. The ventilation volume increases from 112 ml in pre-test to 579 ml in post-test. In the pre-test, 88% of the participants did not succeed in securing an open airway; only six participants succeeded in securing an open airway. In the post-test, 49% of the participants underperform in the ventilation. However, only 12 participants failed in securing an open airway in the post-test. Compression recoil and hand position marginally improved from pre- to post-test. CONCLUSION: Educating young people at school is one way to disseminate CPR knowledge in society. In this study, the ventilation of the patient arose as a major weakness. To be able to establish an open airway and ventilate the patient with the correct volume as well as to overcome the psychological barrier to initiate mouth-to-mouth ventilation seems to require more than 2 h training. The training may need to consist of repeated sessions over the year with feedback, to give young people the skills to perform CPR with good quality.

FREE FULL TEXT

The effects of route of admission to a percutaneous coronary intervention centre among patients with out-of-hospital cardiac arrest.

Suh J[1], Ahn KO[2], Shin SD[3].

Abstract

AIM: Patients with OHCA who are not transported directly to a percutaneous coronary intervention (PCI)-capable hospital may eventually undergo an inter-hospital transfer (IHT). The aim of the present study was to investigate the effects of route of admission to a PCI centre among patients with OHCA. METHODS: We included patients with OHCA of presumed cardiac aetiology that were admitted to a PCI centre between January 2015 and December 2016. The exposure variable was route of admission: direct versus indirect. The 'direct' group was defined as patients who were transferred directly from the field to a PCI centre by emergency medical service (EMS) providers. The 'indirect' group was defined as patients who underwent IHT from a non-PCI centre to a PCI centre. The primary outcome was neurological recovery. We evaluated the effects of route of admission using multivariable logistic regression analysis after adjusting for potential confounders. RESULTS:

There were total of 4,363 eligible patients: 3,488 (78.2%) in the direct group and 975 (21.8%) in the indirect group. Neurologic recovery was better in the direct group (38.0%) than in the indirect group (29.0%). After adjusting for potential confounders, indirect admission was negatively associated with outcomes (adjusted odds ratio [aOR] 0.70; 95% confidence interval [CI] 0.58- 0.85). CONCLUSIONS:

The route of admission to a PCI centre is associated with neurological recovery among resuscitated patients with OHCA of presumed cardiac aetiology. This has implications for regionalized EMS transport and IHT protocols for patients with OHCA.

CURES POST-RCE

Influence of comorbidity on survival after out-of-hospital cardiac arrest in the United States.

Pasupula DK[1], Bhat AG[2], Meera SJ[3], Siddappa Malleshappa SK[2].

Abstract

AIM: Association between survival rate and Elixhauser Comorbidity Index (ECI) among individuals suffering an Out-of-Hospital Cardiac Arrest (OHCA) in the United States (US) METHODS: We utilized the US National Emergency Department Sample (NEDS) dataset to retrospectively identify individuals experiencing OHCA between January 1, 2006 to December 31, 2015; using the International Classification of Diseases, Ninth Revision-Clinical Modification (ICD-9-CM) and Tenth Revision-Clinical Modification (ICD-10-CM) codes. Logistic regression analysis with twenty-nine ECIs as predictor variables were performed to compute for odds ratio (OR), after controlling for age and gender. Linear regression analysis performed to assess survival trend after clustering based on ECI. We also assessed the association of ECI with survival rate after stratifying patients based on cardiac rhythm (shockable versus non-shockable). RESULTS: We identified 1,282,520 (16.4%, survived-to-discharge) weighted observations presenting primarily after OHCA in the US during the study period. Annual percentage change (APC) in survival rate among OHCA patients with no ECI and those with > 3 ECI was -1.53% (95% CI: -1.98% to -1.09%, $P_{trend} < 0.001$) and 1.2% (95% CI: 0.69% to 1.7%, $P_{trend} = 0.001$), respectively. Adjusted OR for ECI was 1.31 (95% CI: 1.3 to 1.31, $P < 0.001$). Percentage change in the survival rate among shockable and non-shockable rhythm was 5.6% (95%CI: -3.9% to 15.13%, $P_{trend} = 0.127$) and 1.04% (95% CI: 0.01% to 2.07%, $P_{trend} = 0.05$), respectively, with a unit increase in ECI. CONCLUSION: In the US, OHCA patients with higher ECI have greater survival-to-discharge rate, demonstrating "Comorbidity Paradox".

PEDIATRIA

Drugs in the delivery room.

Ramachandran S(1), Wyckoff M(2).

Abstract

The need for cardiopulmonary resuscitation in newborns is quite rare, as most non-vigorous infants respond well to effective ventilation. For the minority of babies who do not respond to adequate ventilation, chest compressions are necessary using the preferred two thumb technique. Since effective ventilation remains a key component to successful resuscitation, chest compressions are coordinated with ventilations in a 3:1 ratio. If despite adequate ventilation and compressions, the heart rate remains below 60 beats per minute, epinephrine is indicated. The intravenous route is preferred over the endotracheal route and the recommended dose of epinephrine is 0.01-0.03 mg/kg. This can be repeated every 3-5 min until return of spontaneous circulation is achieved. In rare instances, when there is no response to these above measures and in infants who show evidence of significant hypovolemia, volume replacement should be considered.

Use of a Mechanical Ventilator with Respiratory Function Monitoring Provides More Consistent Ventilation during Simulated Neonatal Resuscitation.

Jain D(1), D'Ugard C(2), Aguilar A(2), Del Moral T(2), Bancalari E(2), Claure N(2).

Abstract

INTRODUCTION: Positive pressure ventilation (PPV) with T-Piece and self-inflating bag (SIB) during neonatal resuscitation after birth is associated with variability in ventilation. The use of a ventilator with respiratory function monitoring (RFM) for PPV, however, has not been evaluated.

OBJECTIVE: To determine if ventilator + RFM can reduce ventilation variability compared to T-Piece and SIB in a preterm manikin at different combinations of target tidal volume (VT) and lung compliance (CL). METHODS: Twenty clinicians provided PPV via mask and endotracheal tube (ETT)

using SIB, T-Piece, T-Piece + RFM and Ventilator + RFM to a manikin with adjustable lung CL. Three combinations of CL and target VT: Low CL-Low VT, Low CL-High VT and High CL-Low VT were used in a random order. RESULTS: The use of ventilator + RFM for PPV via ETT during High CL-Low VT period

reduced the proportion of breaths with expiratory VT above target when compared to the other 3 devices (56 ± 35%, 85 ± 20%, 90 ± 25%, 92 ± 12% for ventilator + RFM, T-Piece + RFM, T-Piece, SIB, respectively; $p < 0.05$). During PPV via both mask and ETT, ventilator + RFM maintained the set Ti and rate, whereas SIB and T-Piece use resulted in higher rates, and T-Piece in higher proportion of breaths with prolonged Ti. During PPV via mask, ventilator + RFM reduced gas leakage

compared to other devices. CONCLUSION: In this simulation study, use of a mechanical ventilator with RFM led to an overall improvement in volume targeting at different settings of CL and

reduced the gas leak during mask ventilation. The efficacy and safety of using this strategy to neonatal resuscitation in the delivery room needs to be evaluated.

RECERCA EXPERIMENTAL

Changes of Endothelin-1 and Nitric Oxide Systems in Brain Tissue During Mild Hypothermia in a Porcine Model of Cardiac Arrest.

Wu J(1), Li Z(2), Yuan W(1), Zhao Y(1), Li J(3), Li Z(4), Li J(5), Li C(6).

Abstract

BACKGROUND: Our previous study found that mild hypothermia (MH) after resuscitation reduced cerebral microcirculation, but the mechanism was not elucidated. The aim of this study was to clarify changes of endothelin-1 (ET-1) and nitric oxide (NO) systems in brain tissue during hypothermia after resuscitation.

METHODS: Twenty-six domestic male Beijing Landrace pigs were used in this study. MH was intravascularly induced 1 h after resuscitation from 8-min ventricular fibrillation. Core temperature was reduced to 33 °C and maintained until 8 h after resuscitation, and then animals were euthanized. ET-1 and NO levels in brain tissue and peripheral plasma were measured. Expression of endothelin-converting enzyme-1 (ECE-1), endothelin A receptor (ET-AR), endothelin-B receptor, and nitric oxide synthase (NOS) in brain tissue was determined by Western blot analysis.

RESULTS: Compared with non-hypothermia (NH) treatment, MH after resuscitation significantly increased the level of endothelin-1 and reduced the level of NO in peripheral blood and brain tissue. Cerebral expression of ECE-1 and ET-AR was significantly increased during MH after resuscitation. Moreover, MH significantly decreased

inducible NOS expression compared with the NH group. CONCLUSIONS: The ET-1 system is activated, while inducible NOS is inhibited in brain tissue during MH after resuscitation.

Combined Treatment with Hydrophilic and Lipophilic Statins Improves Neurological Outcomes Following Experimental Cardiac Arrest in Mice.

Nakayama S(1), Taguchi N(2), Isaka Y(3), Nakamura T(3), Tanaka M(4).

Abstract

BACKGROUND: Global ischemia due to cardiac arrest (CA) followed by cardiopulmonary resuscitation (CPR) causes significant neuronal damage in vulnerable areas in the brain. Currently, a majority of patients eventually die after successful CPR due to neurological injury. Statins have pleiotropic effects including anti-inflammatory and/or antioxidant responses. These pleiotropic effects can have a beneficial role in the post-CPR phase. We tested whether two different types of statins, hydrophilic pravastatin and lipophilic simvastatin, attenuated neurological injury following CA/CPR. The efficacy of pravastatin and simvastatin combination treatment was also assessed.

METHODS: Isoflurane-anesthetized adult male wild-type C57Bl/6 mice subjected to 8-min CA/CPR were randomized into four groups: control, 2 mg/kg pravastatin, 20 mg/kg simvastatin, or a combination of 3 mg/kg pravastatin and 10 mg/kg simvastatin. Neurobehavioral assessment and histological analyses were performed to assess overall general health condition and neuronal injury, respectively. RESULTS: Combination treatment with pravastatin and simvastatin significantly reduced neuronal injury in the striatum and hippocampus, reduced cerebral edema, and improved general health at 4 days after CA/CPR. Combination statin treatment upregulated endothelial nitric oxide synthase mRNA in the brain. Pravastatin alone, but not simvastatin alone, improved general health after CA/CPR. Pravastatin was less potent than simvastatin at reducing neuronal injury in the brain. CONCLUSION: Combination treatment with two different types of statins at the correct dose may be a promising approach to neuroprotection following CA/CPR.

Therapy-Resistant Ventricular Arrhythmias Developed More Often in Advanced Than in Therapeutic Mild Hypothermic Condition.

Saitoh O(1), Watanabe J(1), Oikawa A(1), Sugai A(1), Furushima H(1), Chinushi M(1).

Abstract

Therapy-resistant ventricular arrhythmias can occur during accidental advanced hypothermic conditions. On the other hand, hypothermic therapy using mild cooling has been successfully accomplished with infrequent ventricular arrhythmia events. To further clarify the therapeutic-resistant arrhythmogenic substrate which develops in hypothermic conditions, an experimental study was performed using a perfusion wedge preparation model of porcine ventricle, and

electrophysiological characteristics, inducibility of ventricular arrhythmias, and effects of therapeutic interventions were assessed at 3 target temperatures (37, 32 and 28°C). As the myocardial temperature decreased, myocardial contractions and the number of spontaneous beats deceased. Depolarization (QRS width, stimulus-QRS interval) and repolarization (QT interval, ERP) parameters

progressively increased, and dispersion of the ventricular repolarization increased. At 28°C, VF tended to be inducible more frequently (1/11 at 37°C, 1/11 at 32°C, and 5/11 hearts at 28°C), and some VFs at 28°C required greater defibrillation energy to resume basic rhythm.An advanced but not a mild hypothermic condition had an enhanced arrhythmogenic potential in our model. In the advanced hypothermic condition, VF with relatively prolonged F-F

intervals and a greater defibrillation energy were occasionally inducible based on the arrhythmogenic substrate characterized as slowed conduction and prolonged repolarization of the ventricle.

CASE REPORTS

Intentional overdose of the novel anti-epileptic drug eslicarbazepine presenting with recurrent seizures and ventricular dysrhythmias.

Thompson J(1), Powell JD(2), Ovakim DH(3).

Abstract

Eslicarbazepine is a novel anti-epileptic agent indicated for the treatment of partial-onset seizures. We present the case of an 18 year old female that presented to the Emergency Department four hours after a reported intentional ingestion of an estimated 5600 mg of eslicarbazepine. Although initially hemodynamically stable and neurologically normal, shortly after arrival she developed confusion, rigidity and clonus, followed by recurrent seizures, hypoxemia and cardiac arrest which responded to cardiopulmonary resuscitation and wide complex tachycardia requiring defibrillation. Treatment for refractory seizures included benzodiazepines and eventual intubation and sedation with propofol. Cardiac toxicity responded to sodium bicarbonate. In addition, empiric hemodialysis was performed. In this case report, we discuss the successful management of the first reported overdose of eslicarbazepine using supportive care and hemodialysis.

Bolus dose of epinephrine for refractory post-arrest hypotension.

Gottlieb M(1).

Abstract

Post-cardiac arrest hypotension is associated with worse outcomes. However, a significant proportion of patients may not be responsive to intravenous (IV) fluids, and vasopressor infusions require significant time to initiate. This case series describes the successful use of a bolus dose of epinephrine to rapidly treat IV fluid refractory hypotension among three patients in the post-arrest period. A bolus dose of epinephrine may be considered as a treatment for post-arrest hypotension that does not respond to IV fluids, but further studies should be performed prior to routine use.

Metformin-associated lactic acidosis: A case reporting a serious complication in the perioperative period.

Gonçalves BM(1), Coelho D(2).

Abstract

The worldwide prevalence of diabetes mellitus (DM) has risen dramatically over the past two decades and this affects 10-15% of the surgical population[1]. Metformin represents the mainstay of anti-hyperglycaemic therapy for type 2 DM, providing numerous beneficial effects. However, a rare but severe adverse effect is the development of metformin-associated lactic acidosis (MALA) with high mortality rate. We describe a severe case of MALA in the

postoperative period that culminated in cardiac arrest. Whereby anaesthetists should be knowledgeable and skilled in the care of patients with diabetes being imperative to focus on preoperative assessment, optimisation, management of pre-existing treatment during the starvation period and identification of patients medicated with metformin at risk of developing MALA.

Having a Conscious Patient During Cardiopulmonary Resuscitation: Is It Not Time to Consider Sedation Protocol?: A Case Report.

Sukumar V[1].

Abstract

A middle-aged man with acute inferior wall myocardial infarction was admitted in cardiac arrest and in an unresponsive state to the hospital. Cardiopulmonary resuscitation (CPR) was initiated. Patient showed signs of consciousness throughout the CPR. The impact of awareness during CPR on the neuropsychological status of a patient with a favourable neurological outcome is yet to be studied on a large scale. Sedation protocol without compromising hemodynamic status may prove a fair choice in such cases.

RCP/COMPRESSIONS TORÀCIQUES MECÀNIQUES

Efficacy and safety of active abdominal compression-decompression versus standard CPR for cardiac arrests: A systematic review and meta-analysis of 17 RCTs.

Wang JP(1), Zhang YM(2), Yang RJ(3), Zhang K(3), Chai MM(3), Zhou DC(3).

Abstract

BACKGROUND & AIM: Active abdominal compression-decompression cardiopulmonary resuscitation (AACD-CPR), which applies to cardiac arrests with contraindication of standard chest compressions (SCC) CPR, has been utilized in cardiac arrest. However, the efficacy and safety of AACD-CPR still remained controversy. This analysis was designed to comprehensively compare AACD versus SCC-CPR in patients with cardiac arrest. METHODS: We searched the Cochrane Library, PubMed, EMBASE, Web of Science and CNKI up to April 22, 2019. Mean difference (MD) and risk ratio (RR) with its 95% confidence intervals (CIs) were estimated to compare outcomes of the groups. Our primary outcomes were restoration of spontaneous circulation (ROSC) and short-term survival. Two reviewers assessed trial quality and extracted data independently. All statistical analyses were performed using standard statistical procedures provided in Review Manager 5.2 and Stata 12.0. RESULTS: A total of seventeen studies (N = 1647 patients) were identified for the present analysis. Compared with standard CPR, AACD-CPR was superior in restoration of spontaneous circulation (ROSC) and short-term survival, with pooled RRs of 1.38 (95% CI 1.23-1.55; P < 0.00001) and RRs of 2.05 (95% CI 1.69-2.50; P < 0.00001) respectively. In addition, significant superiority of AACD-CPR was found in incidence of fracture, long-term survival, pressure of end-tidal carbon dioxide (PETCO2), coronary perfusion pressure (CPP) and adverse events. No significant difference was observed in incidence of vomiting. CONCLUSIONS: Generally, in this combined analysis we found a statistically significant improvement in survival and ROSC with the use of AACD-CPR as compared with the use of standard CPR. There was also significant improvement in incidence of fracture, long-term survival, PETCO$_2$ and CPP with AACD-CPR in comparison with standard CPR; results were not statistically different between the groups regarding to vomiting rate and adverse events. The standardized, diversified and individualized methods of clinical operation of AACD-CPR need exploration and expectingly serve as a guideline for clinical application of AACD-CPR in the future.

Chest Compression Release Velocity Factors During Out-of-Hospital Cardiac Resuscitation.

Beger S(1), Sutter J(2), Vadeboncoeur T(3), Silver A(4), Hu C(5), Spaite DW(6), Bobrow B(7).

Abstract

BACKGROUND: Higher chest compression release velocity (CCRV) has been associated with better outcomes after out-of-hospital cardiac arrest (OHCA), and patient factors have been associated with variations in chest wall compliance and compressibility. We evaluated whether patient sex, age, weight, and time in resuscitation were associated with CCRV during pre-hospital resuscitation from OHCA. METHODS: Observational study of prospectively collected OHCA quality improvement data in two suburban EMS agencies in Arizona between 10/1/2008 and 12/31/2016. Subject-level mean CCRV during the first 10 minutes of compressions was correlated with categorical variables by the Wilcoxon rank-sum test and with continuous variables by the Spearman's rank correlation coefficient. Generalized estimating equation and linear mixed-effect models were used to study the trend of CCRV over time. RESULTS: During the study period, 2,535 adult OHCA cases were treated. After exclusion criteria, 1,140 cases remained for analysis. Median duration of recorded compressions was 8.70 minutes during the first 10 minutes of CPR. An overall decline in CCRV was observed even after adjusting for compression depth. The subject-level mean CCRV was higher for minutes 0-5 than for minutes 5-10 (mean 347.9 mm/s vs. 339.0 mm/s, 95% CI of the difference -12.4 ~ -5.4, $p < 0.0001$). Males exhibited a greater mean CCRV compared to females [344.4 mm/s (IQR 307.3-384.6) vs. 331.5 mm/s (IQR 285.3-385.5), $p = 0.013$]. Mean CCRV was negatively correlated with age and positively correlated with patient weight. CONCLUSION: CCRV declines significantly over the course of resuscitation. Patient characteristics including male sex, younger age, and increased weight were associated with a higher CCRV.

REGISTRES, REVISIONS I EDITORIALS

Better Cardiac Arrest Outcomes in Hospitals with More Nurses with BSNs.

Rosenberg K.

ABSTRACT NOT AVAILABLE

FAD: Systematic review of the literature about the effect of palliative care on quality of live and survival after CPR.

Effect of Palliative Care on Quality of Life and Survival after Cardiopulmonary Resuscitation: A Systematic Review.

Hasanpour Dehkordi A(1), Sarokhani D(2), Ghafari M(3), Mikelani M(4), Mahmoodnia L(5).

Abstract

BACKGROUND: Cardiac and respiratory arrest is reversible through immediate cardiopulmonary resuscitation (CPR). However, survival after CPR is very low for various reasons. This systematic review study was conducted to assess the effect of palliative care on quality of life and survival after CPR. METHODS: In the present meta-analysis and systematic review study, two researchers independently searched Google Scholar and MagIran, MedLib, IranMedex, SID, and PubMed for articles published during 1994-2016 and containing a number of relevant keywords and their Medical Subject Headings (MeSH) combinations. A total of 156 articles were initially extracted. RESULTS: The success of initial resuscitation was reported to be much higher than the success of secondary resuscitation (survival until discharge). Moreover, the early detection of cardiac arrest, a high-quality CPR, immediate defibrillation, and effective postresuscitation care improved short- and long-term outcomes in these patients and significantly affected their quality of life after CPR. Most survivors of CPR can have a reasonable quality of life if they are given proper follow-up and persistent treatment. CONCLUSIONS: Concerns about the low quality of life after CPR are therefore not a worthy reason to end the efforts taken for the victims of cardiac arrest. More comprehensive education programs and facilities are required for the resuscitation of patients and the provision of post-CPR intensive care.

ACR INTRAHOSPITALÀRIA

In-hospital cardiopulmonary resuscitation of patients with cirrhosis: A population-based analysis.

Oud L(1).

Abstract

OBJECTIVE: To examine the epidemiology and outcomes of in-hospital cardiopulmonary resuscitation (CPR) among patients with cirrhosis. METHODS: We used the Texas Inpatient Public Use Data File to identify hospitalizations aged ≥ 18 years with and without cirrhosis during 2009-2014 and those in each group who have undergone in-hospital CPR. Short-term survival (defined as absence of hospital mortality or discharge to hospice) following in-hospital CPR was examined. Multivariate logistic regression modeling was used to assess the prognostic impact of cirrhosis following in-hospital CPR and predictors of short-term survival among cirrhosis hospitalizations. RESULTS: In-hospital CPR was reported in 2,511 and 51,969 hospitalizations with and without cirrhosis, respectively. The rate of in-hospital CPR (per 1,000 hospitalizations) was 7.6 and 4.0 among hospitalizations with and without cirrhosis, respectively. The corresponding rate of in-hospital CPR among decedents was 10.7% and 13.4%, respectively. Short-term survival following in-hospital CPR among hospitalizations with and without cirrhosis was 14.9% and 27.3%, respectively, and remained unchanged over time on adjusted analyses among the former (p = 0.1753), while increasing among the latter (p = 0.0404). Cirrhosis was associated with lower odds of short-term survival following in-hospital CPR (adjusted odds ratio [aOR] 0.55 [95% CI: 0.49-0.62]). Lack of health insurance (vs. Medicare) (aOR] 0.47 [95% CI: 0.34-0.67]) and sepsis ([aOR] 0.67 [95% CI: 0.53-85]) were associated with lower odds of short-term survival following in-hospital CPR among cirrhosis hospitalizations. CONCLUSIONS: The rate of in-hospital CPR was nearly 2-fold higher among hospitalizations with cirrhosis than among those without it, though it was used more selectively among the former. Short-term survival following in-hospital CPR remained markedly lower among cirrhosis hospitalizations, while progressively improving among those without cirrhosis. Strategies to increase access to health insurance and improve early identification and control of infection should be explored in future preventive and interventional efforts.

CAUSES DE L'ACR

Association of school hours with outcomes of out-of-hospital cardiac arrest in schoolchildren.

Yamashita A(1)(2), Kurosaki H(1), Takada K(1), Tanaka Y(1)(3), Hamada Y(4), Ishita T(5), Kubo M(6), Inaba H(1).

Abstract

OBJECTIVE: To investigate the association of school hours with outcomes of schoolchildren with out-of-hospital cardiac arrest (OHCA). METHODS: From the 2005-2014 nationwide databases, we extracted the data for 1660 schoolchildren (6-17 years) with bystander-witnessed OHCA. Univariate analyses followed by propensity-matching procedures and stepwise logistic regression analyses were applied. School hours were defined as 08:00 to 18:00. RESULTS: The neurologically favourable 1-month survival rate during school hours was better than that during non-school hours only on school days: 18.4% and 10.5%, respectively. During school hours on school days, patients with OHCA more frequently received bystander cardiopulmonary resuscitation (CPR) and public access defibrillation (PAD), and had a shockable initial rhythm and presumed cardiac aetiology. The neurologically favourable 1-month survival rate did not significantly differ between school hours on school days and all other times of day after propensity score matching: 16.4% vs 16.1% (unadjusted OR 1.02; 95% CI 0.69 to 1.51). Stepwise logistic regression analysis during school hours on school days revealed that shockable initial rhythm (adjusted OR 2.44; 95% CI 1.12 to 5.42), PAD (adjusted OR 3.32; 95% CI 1.23 to 9.10), non-exogenous causes (adjusted OR 5.88; 95% CI 1.85 to 20.0) and a shorter emergency medical service (EMS) response time (adjusted OR 1.15; 95% CI 1.02 to 1.32) and witness-to-first CPR interval (adjusted OR 1.08; 95% CI 1.01 to 1.15) were major factors associated with an improved neurologically favourable 1-month survival rate. CONCLUSIONS: School hours are not an independent factor associated with improved outcomes of OHCA in schoolchildren. The time delays in CPR and EMS arrival were independently associated with poor outcomes during school hours on school days.

Association between ambient air pollution and out-of-hospital cardiac arrest: are there potentially susceptible groups?

Cheng FJ(1)(2), Wu KH(1), Hung SC(1), Lee KH(3), Lee CW(2), Liu KY(4), Hsu PC(5).

Abstract

This study aimed to examine the association between air pollution and out-of-hospital cardiac arrest (OHCA), and the effects of underlying diseases. Between January 2015 and December 2016, data on particulate matter $(PM)_{2.5}$ and other air pollutants in Kaohsiung City were collected, and an emergency medical service database was used for information on patients who experienced OHCA. Overall, 3566 patients were analyzed and subgroup analyses by sex, age, and preexisting morbidities were performed. Interquartile increments in $PM_{2.5}$, PM_{10}, and O_3 levels on lag 1 and NO_2 level on lag 3 were associated with increments of 10.8%, 11.3%, 6.2%, and 1.7% in OHCA incidence, respectively. Subgroup analyses showed that patients with diabetes (1.363; interaction p = 0.009), heart disease (1.612; interaction p = 0.001), and advanced age (≥70 years, 1.297; interaction p = 0.003) were more susceptible to NO_2 on lag 3. Moreover, patients were more susceptible to O_3 during the cold season (1.194; interaction p = 0.001).

We found that $PM_{2.5}$, PM_{10}, NO_2, and O_3 may play an important role in OHCA events, and the effects vary by underlying condition, age and season.

Exercise related sudden cardiac death (SCD) in the young - pre-mortal characterization of a Swedish nationwide cohort, showing a decline in SCD among athletes.

Wisten A(1), Börjesson M(2), Krantz P(3), Stattin EL(4).

Abstract

AIMS: To study the frequency, etiology, and premortal abnormalities in exercise-related sudden cardiac death (SCD) in the young in Sweden. METHODS: All subjects with SCD in 10-35-year olds in Sweden during 2000-10, were included (n = 514). Information about each case was retrieved from death certifications, autopsy- and medical records. The number of SCD in athletes was compared to national figures from 1992-99. RESULTS: Exercise-related SCD occurred in 12 % (62/514) of the SCD-population, a majority being men (56/62; 90 %). Cardiopulmonary resuscitation (CPR) was started in 87% (54/62). In total, 48% (30/62), had a cardiac diagnosis, symptoms, family history and/or ECG-changes, before the fatal event. The most prevalent autopsy diagnosis was sudden arrhythmic death syndrome (15/62; 24%). The frequency of hypertrophic cardiomyopathy (HCM) and arrhythmogenic right ventricular cardiomyopathy (ARVC) was significantly higher in exercise-related SCD compared to non-exertional SCD. Exercise-related SCD was more common in athletes (21/29) than in non-athletes (41/485) (P < 0.0001). The total number of SCDs/year in athletes 15-35 years old, are approximately halved in 2000-10 compared to the years 1992-99. CONCLUSION: The increased risk of exercise-related SCD in HCM and ARVC underlines the importance of early detection and eligibility recommendations. There is a major reduction in deaths among athletes in the 2000s, compared to the previous decade. These results may partly be explained by improved acute preparedness for sudden cardiac arrest (CPR, defibrillation), but as a substantial percentage have preceding risk factors, such as symptoms and ECG-abnormalities, increased cardiac screening and increased general awareness, may also play a role.

FEEDBACK

How should we teach cardiopulmonary resuscitation? Randomized multi-center study.

Katipoglu B(1), Madziala MA(2), Evrin T(1), Gawlowski P(3), Szarpak A(4),

Dabrowska A(5), Bialka S(6), Ladny JR(7), Szarpak L(8), Konert A(4), Smereka

J(3).

Abstract

BACKGROUND: A 2017 update of the resuscitation guideline indicated the use of CPR feedback devices as a resuscitation teaching method. The aim of the study was to compare the influence of two techniques of cardiopulmonary resuscitation teaching on the quality of resuscitation performed by medical students. METHODS: The study was designed as a prospective, randomized, simulation study and involved 115 first year students of medicine. The participants underwent a Basic Life Support course based on the American Heart Association guidelines, with the first group (experimental group) performing chest compressions to observe, in real-time,

chest compression parameters indicated by software included in the simulator, and the second group (control group) performing compressions without this possibility. After a 10-minute resuscitation, the participants had a 30-minute break and then a 2-minute cycle of cardiopulmonary resuscitation. One month after the training, study participants performed cardiopulmonary resuscitation, without the possibility of observing real-time measurements regarding quality of chest compression. RESULTS: One month after the training, depth of chest compressions in the experimental and control group was 50 mm (IQR 46-54) vs. 39 mm (IQR 35-42; p = 0.001; Fig. 2)., compression rate 116 CPM (IQR 102-125) vs. 124 CPM (IQR 116-134; p = 0.034), chest relaxation 86% (IQR 68-89) vs. 74% (IQR 47-80; p = 0.031) respectively. CONCLUSIONS: Observing real-time chest compression quality parameters during Basic Life Support training may improve the quality of chest compression one month after the training including correct hand positioning, compressions depth and rate compliance.

FREE FULL TEXT

VENTILACIÓ

Associations between partial pressure of oxygen and neurological outcome in out-of-hospital cardiac arrest patients: an explorative analysis of a randomized trial.

Ebner F(1), Ullén S(2), Åneman A(3), Cronberg T(4), Mattsson N(4), Friberg H(5), Hassager C(6)(7), Kjærgaard J(6)(7), Kuiper M(8), Pelosi P(9)(10), Undén J(11), Wise MP(12), Wetterslev J(13), Nielsen N(14).

Abstract

OBJECTIVE: Exposure to hyperoxemia and hypoxemia is common in out-of-hospital cardiac arrest (OHCA) patients following return of spontaneous circulation (ROSC), but its effects on neurological outcome are uncertain, and study results are inconsistent. METHODS: Exploratory post hoc substudy of the Target Temperature Management (TTM) trial, including 939 patients after OHCA with return of spontaneous circulation (ROSC). The association between serial arterial partial pressures of oxygen (PaO_2) during 37 h following ROSC and neurological outcome at 6 months, evaluated by Cerebral Performance Category (CPC), dichotomized to good (CPC 1-2) and poor (CPC 3-5), was investigated. In our analyses, we tested the association of hyperoxemia and hypoxemia, time-weighted mean PaO_2, maximum PaO_2 difference, and gradually increasing PaO_2 levels (13.3-53.3 kPa) with poor neurological outcome. A subsequent analysis investigated the association between PaO_2 and a biomarker of brain injury, peak serum Tau levels. RESULTS: Eight hundred sixty-nine patients were eligible for analysis. Three hundred patients (35%) were exposed to hyperoxemia or hypoxemia at some time point after ROSC. Our analyses did not reveal a significant association between hyperoxemia, hypoxemia, time-weighted mean PaO_2 exposure or maximum PaO_2 difference and poor neurological outcome at 6-month follow-up after correction for co-variates (all analyses p = 0.146-0.847). We were not able to define a PaO_2 level significantly associated with the onset of poor neurological outcome. Peak serum Tau levels at either 48 or 72 h after ROSC were not associated with PaO_2. CONCLUSION: Hyperoxemia or hypoxemia exposure occurred in one third of the patients during the first 37 h of hospitalization and was not significantly associated with poor neurological outcome after 6 months or with the peak s-Tau levels at either 48 or 72 h after ROSC.

FREE FULL TEXT

ECOGRAFIA EN L'ACR

Do combined ultrasound and electrocardiogram-rhythm findings predict survival in emergency department cardiac arrest patients? The Second Sonography in Hypotension and Cardiac Arrest in the Emergency Department (SHoC-ED2) study.

Beckett N(1)(2)(3), Atkinson P(1)(3), Fraser J(1), Banerjee A(1), French J(1)(3), Talbot JA(1)(3), Stoica G(4), Lewis D(1)(3).

Abstract

OBJECTIVES: Point-of-care ultrasound (POCUS) is used increasingly during resuscitation. The aim of this study was to assess whether combining POCUS and electrocardiogram (ECG) rhythm findings better predicts outcomes during cardiopulmonary resuscitation in the emergency department (ED).

METHODS: We completed a health records review on ED cardiac arrest patients who underwent POCUS. Primary outcome measurements included return of spontaneous circulation (ROSC), survival to hospital admission, and survival to hospital discharge. RESULTS: POCUS was performed on 180 patients; 45 patients (25.0%; 19.2%-31.8%) demonstrated cardiac activity on initial ECG, and 21 (11.7%; 7.7%-17.2%) had cardiac activity on initial POCUS; 47 patients (26.1%; 20.2%-33.0%) achieved ROSC, 18 (10.0%; 6.3%-15.3%) survived to admission, and 3 (1.7%; 0.3%-5.0%) survived to hospital discharge. As a predictor of failure to achieve ROSC, ECG had a sensitivity of 82.7% (95% CI 75.2%-88.7%) and a specificity of 46.8% (32.1%-61.9%). Overall, POCUS had a higher sensitivity of 96.2% (91.4%-98.8%) but a similar specificity of 34.0% (20.9%-49.3%). In patients with ECG-asystole, POCUS had a sensitivity of 98.18% (93.59%-99.78%) and a specificity of 16.00% (4.54%-36.08%). In patients with pulseless electrical activity, POCUS had a sensitivity of 86.96% (66.41%-97.22%) and a specificity of 54.55% (32.21%-75.61%). Similar patterns were seen for survival to admission and discharge. Only 0.8% (0.0-4.7%) of patients with ECG-asystole and standstill on POCUS survived to hospital discharge. CONCLUSION: The absence of cardiac activity on POCUS, or on both ECG and POCUS together, better predicts negative outcomes in cardiac arrest than ECG alone. No test reliably predicted survival.

MONITORATGE CEREBRAL

The usefulness of neuron-specific enolase in cerebrospinal fluid to predict neurological prognosis in cardiac arrest survivors who underwent target temperature management: a prospective observational study.

You Y(1), Park JS(2), Min J(1), Yoo I(3), Ahn HJ(1), Cho Y(1), Ryu S(1), Lee J(1), Kim S(3), Cho S(1), Oh S(1), Jeong W(1), Kang C(1), Oh E(4), Lee IH(5), Lee B(6), Lee D(6), Youn CS(7).

Abstract

AIM: Cerebrospinal fluid (CSF) neuron-specific enolase (NSE) levels increase ahead of serum NSE levels in patients with severe brain injury. We examined the prognostic performance between CSF NSE and serum NSE levels in out-of-cardiac arrest (OHCA) survivors who had undergone target temperature management (TTM). METHODS: This single-centre prospective observational study included OHCA patients who had undergone TTM. NSE levels were assessed in blood and CSF samples obtained immediately (Day 0), and at 24 h (Day 1), 48 h (Day 2), and 72 h (Day 3) after return of spontaneous circulation (ROSC). The primary outcome was the 6-month neurological outcome. RESULTS: We enrolled 34 patients (males, 24; 70.6%), and 16 (47.1%) had a poor neurologic outcome. CSF NSE and serum NSE values were significantly higher in the poor outcome group compared to the good outcome group at each time point, except for serum Day 0. CSF NSE and serum NSE had an area under curve (AUC) of 0.819-0.972 and 0.648-0.920, respectively. CSF NSE prognostic performances were significantly higher than serum NSE levels at Day 1 and showed excellent AUC values (0.969; 95% confidence interval [CI] 0.844-0.999) and high sensitivity (93.8%; 95% CI 69.8-99.8) at 100% specificity. CONCLUSION: We found CSF NSE values were highly predictive and

sensitive markers of 6-month poor neurological outcome in OHCA survivors treated with TTM at Day 1 after ROSC. Therefore, CSF NSE levels at day 1 after ROSC can be a useful early prognosticator in OHCA survivors.

ORGANITZACIÓ I ENTRENAMENT

Racial and Ethnic Disparities in Postcardiac Arrest Targeted Temperature Management Outcomes.

Jacobs CS(1), Beers L(2), Park S(2), Scirica B(3), Henderson GV(2), Hsu L(4), Bevers M(2), Dworetzky BA(2), Lee JW(2).

Abstract

OBJECTIVES: To evaluate racial and ethnic disparities in postcardiac arrest outcomes in patients undergoing targeted temperature management. DESIGN: Retrospective study. SETTING: ICUs in a single tertiary care hospital. PATIENTS: Three-hundred sixty-seven patients undergoing postcardiac arrest targeted temperature management, including continuous electroencephalogram monitoring. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Clinical variables examined in our clinical cohort included race/ethnicity, age, time to return of spontaneous circulation, cardiac rhythm at time of arrest, insurance status, Charlson Comorbidity Index, and time to withdrawal of life-sustaining therapy. CT at admission and continuous electroencephalogram monitoring during the first 24 hours were used as markers of early injury. Outcome was assessed as good (Cerebral Performance Category 1-2) versus poor (Cerebral Performance Category 3-5) at hospital discharge. White non-Hispanic ("White") patients were more likely to have good outcomes than white Hispanic/nonwhite ("Non-white") patients (34.4 vs 21.7%; p = 0.015). In a multivariate model that included age, time to return of spontaneous circulation, initial rhythm, combined electroencephalogram/CT findings, Charlson Comorbidity Index, and insurance status, race/ethnicity was still independently associated with poor outcome (odds ratio, 3.32; p = 0.003). Comorbidities were lower in white patients but did not fully explain outcomes differences. Nonwhite patients were more likely to exhibit signs of early severe anoxic changes on CT or electroencephalogram, higher creatinine levels and receive dialysis, but had longer duration to withdrawal of lifesustaining therapy. There was no significant difference in catheterizations or MRI scans. Subgroup analysis performed with patients without early electroencephalogram or CT changes still revealed better outcome in white patients. CONCLUSIONS: Racial/ethnic disparity in outcome persists despite a strictly protocoled targeted temperature management. Nonwhite patients are more likely to arrive with more severe anoxic brain injury, but this does not account for all the disparity.

A Local Neighborhood Volunteer Network Improves Response Times for Simulated Cardiac Arrest.

Kb K(1), Colberg TP(2), Wunder C(3), Newton C(2), Slepian MJ(4).

Abstract

AIM: Each minute is crucial in the treatment of out-of-hospital cardiac arrest (CA). Immediate chest compressions and early defibrillation are keys to good outcomes. We hypothesized that a coordinated effort of alerting trained local neighborhood volunteers (vols) simultaneously with 911 activation of professional EMS providers would result in substantial decreases in call-to-arrival times, leading to earlier CPR and defibrillation. METHODS: We developed a program of simultaneously alerting CPR- and AED-trained neighborhood vols and the local EMS system for CA events in a retirement residential neighborhood in Southern Arizona, encompassing approximately 440 homes. The closest EMS station is 3.3 miles from this neighborhood. Within this neighborhood, 15 vols and the closest EMS station were involved in multiple days of mock CA notifications and responses. RESULTS: The two groups differed significantly in distance to the mock CA event and in response times. The volunteers averaged

0.3 ± 0.2 miles from the mock CA incidences while the closest EMS station averaged 3.4 ± 0.1 miles away (p < 0.0001). Response times (time from call to arrival) also differed. Two volunteers, one bringing an AED, averaged 1 min 38 sec ± 53 sec in Phase 1, while it took the EMS service an average of 7 min 20 sec ±1 min 13 sec to arrive on scene; p < 0.0001. CONCLUSION: Local neighborhood volunteers were geographically closer and arrived significantly sooner at the mock CA scene than did the EMS service. The approximate time savings from call to arrival with the volunteers was 4-6 minutes.

Ethnic disparities in the incidence and outcome from out-of-hospital cardiac arrest: A New Zealand observational study.

Dicker B(1), Todd V(2), Tunnage B(2), Swain A(3), Conaglen K(3), Smith T(4), Brett M(4), Laufale C(4), Howie G(2).

Abstract

BACKGROUND: New Zealand (NZ) has an ethnically diverse population. International studies have demonstrated significant differences in health equity by ethnicity; however, there is limited evidence in the context of out-of-hospital cardiac arrest in NZ. We investigated whether heath disparities in incidence and outcome of out-of-hospital cardiac arrest exist between NZ ethnic groups. METHOD: A retrospective observational study was conducted using NZ cardiac arrest registry data for a 2-year period. Ethnic cohorts investigated were the indigenous Māori population, Pacific Peoples and European/Others. Incidence rates, population characteristics and outcomes (Return of Spontaneous Circulation sustained to hospital handover and thirty-day survival) were compared. RESULTS: Age-adjusted incidence rates per 100,000 person-years were higher in Māori (144.4) and Pacific Peoples (113.5) compared to European/Others (93.8). Return of spontaneous circulation sustained to hospital handover was significantly lower in Māori (adjusted OR 0.74, 95% CI 0.64-0.87, p < 0.001). Survival to thirty-days was lower for both Māori (adjusted OR 0.61, 95%CI 0.48-0.78, p < 0.001) and Pacific Peoples (adjusted OR 0.52, 95% CI 0.37-0.72, p < 0.001). A higher proportion of events occurred in all age groups below 65 years old in Māori and Pacific Peoples (p < 0.001), and a higher proportion of events occurred among women in Māori and Pacific Peoples (p < 0.001). CONCLUSIONS: There are significant differences in health equity by ethnicity. Both Māori and Pacific Peoples have higher incidence of out-of-hospital cardiac arrest and at a younger age. Māori and Pacific Peoples have lower rates of survival to thirty-days. Our results provide impetus for targeted health strategies for at-risk ethnic populations.

CURES POST-RCE

Effects of cholesterol levels on outcomes of out-of-hospital cardiac arrest: a cross-sectional study.

Kim JH(1), Wi DH(2), Lee JH(2), Song HJ(1), Shin SD(3), Ro YS(4), Bae KH(5).

Abstract

OBJECTIVE: High cholesterol level is a risk factor for coronary artery disease, and coronary artery disease is a major risk factor for out-of-hospital cardiac arrest (OHCA). However, the effect of cholesterol level on outcomes of OHCA has been poorly studied. This study aimed to determine the effect of cholesterol level on outcomes of OHCA. METHODS: This cross-sectional study used the CAPTURES (Cardiac Arrest Pursuit Trial with Unique Registration and Epidemiologic Surveillance) project database in Korea. Multivariable conditional logistic regression analysis was performed to estimate the effect of cholesterol level on outcomes in OHCA. RESULTS: In

all, 584 cases of OHCA were analyzed; those with cholesterol levels <120 mg/dL were classified as having low total cholesterol (TC) (n=197), those with levels ranging from 120-199 mg/dL as middle TC (n=322), and those with ≥200 mg/dL as high TC (n=65). Compared to low TC, more patients with middle TC and high TC survived to discharge (9.1% vs. 22.0% and 26.2%, respectively, P=0.001). The good cerebral performance category also increased in that order (4.1% vs. 14.6% and 23.1%, respectively, P≤0.001). Comparing middle TC and high TC with low TC, adjusted odds ratios (95% confidence intervals) were 1.97 (1.06 to 3.64) and 2.53 (1.08 to 5.92) for survival to discharge, respectively, and 2.53 (1.07 to 5.98) and 4.73 (1.63 to 13.71) for good neurological recovery, respectively. CONCLUSION: Higher cholesterol is associated with better outcomes in OHCA; cholesterol level is a good predictor of outcomes of OHCA.

FREE FULL TEXT

Prognostication after cardiac arrest.

Sandroni C(1), D'Arrigo S(2), Nolan JP(3)(4).

Abstract

Hypoxic-ischaemic brain injury (HIBI) is the main cause of death in patients who are comatose after resuscitation from cardiac arrest. A poor neurological outcome-defined as death from neurological cause, persistent vegetative state, or severe neurological disability-can be predicted in these patients by assessing the severity of HIBI. The most commonly used indicators of severe HIBI include bilateral absence of corneal and pupillary reflexes, bilateral absence of N_2O waves of short-latency somatosensory evoked potentials, high blood concentrations of neuron specific enolase, unfavourable patterns on electroencephalogram, and signs of diffuse HIBI on computed tomography or magnetic resonance imaging of the brain. Current guidelines recommend performing prognostication no earlier than 72 h after return of spontaneous circulation in all comatose patients with an absent or extensor motor response to pain, after having excluded confounders such as residual sedation that may interfere with clinical examination. A multimodal approach combining multiple prognostication tests is recommended so that the risk of a falsely pessimistic prediction is minimised.

FREE FULL TEXT

Prognostic Value of Serum Albumin at Admission for Neurologic Outcome with Targeted Temperature Management after Cardiac Arrest.

Kim SH(1), Youn CS(2), Kim HJ(2), Choi SP(1).

Abstract

INTRODUCTION: It is well known that hypoalbuminemia is associated with adverse outcomes in various critical illnesses. However, there are few studies specifically measuring the association between albumin level and neurologic outcomes after CA treated with TTM. The aim of this study was to assess whether serum albumin concentration on admission had prognostic value for OHCA patients treated with TTM. METHODS: We included adult patients aged ≥18 years with nontraumatic OHCA treated with TTM whose serum albumin concentration was available and who were admitted from 2009 to 2016. Serum albumin was measured within 1 h after ROSC, and hypoalbuminemia was defined as admission serum albumin <3.5 g/dl. A good neurologic outcome was defined as a cerebral performance category score of 1 or 2 at 6 months. RESULTS: A total of 255 patients were eligible for analysis, of whom 106 (41.6%) survived to 6 months; 84 (32.9%) of these patients achieved favorable neurologic outcomes. The mean albumin values were significantly lower in patients with poor neurologic outcomes than the values in those with good neurologic outcomes (3.3 ± 0.6 vs. 3.9 ± 0.4, respectively, $p < 0.001$). After adjusting the crude model, patients in the hypoalbuminemia group were 3.5 times more likely to have poor neurologic outcome than were those in the normal albumin group (OR 3.526, 95% CI 1.388-8.956, $p=0.008$). CONCLUSIONS:

Hypoalbuminemia was common after CA, and the serum albumin level at admission was associated with poor neurological outcomes at 6 months after CA in patients treated with TTM.

FREE FULL TEXT

Increased Citrullinated Histone H3 Levels in the Early Post-Resuscitative Period Are Associated with Poor Neurologic Function in Cardiac Arrest Survivors-A Prospective Observational Study.

Mauracher LM(1), Buchtele N(2)(3), Schörgenhofer C(4), Weiser C(5), Herkner H(6), Merrelaar A(7), Spiel AO(8), Hell L(9), Ay C(10)(11), Pabinger I(12), Jilma B(13), Schwameis M(14).

Abstract

The exact contribution of neutrophils to post-resuscitative brain damage is unknown. We aimed to investigate whether neutrophil extracellular trap (NET) formation in the early phase after return of spontaneous circulation (ROSC) may be associated with poor 30 day neurologic function in cardiac arrest survivors. This study prospectively included adult (≥18 years) out-of-hospital cardiac arrest (OHCA) survivors with cardiac origin, who were subjected to targeted temperature management. Plasma levels of specific (citrullinated histone H3, H3Cit) and putative (cell-free DNA (cfDNA) and nucleosomes) biomarkers of NET formation were assessed at 0 and 12 h after admission. The primary outcome was neurologic function on day 30 after admission, which was assessed using the five-point cerebral performance category (CPC) score, classifying patients into good (CPC 1-2) or poor (CPC 3-5) neurologic function. The main variable of interest was the effect of H3Cit level quintiles at 12 h on 30 day neurologic function, assessed by logistic regression. The first quintile was used as a baseline reference. Results are given as crude odds ratio (OR) with 95% confidence interval (95% CI). Sixty-two patients (79% male, median age: 57 years) were enrolled. The odds of poor neurologic function increased linearly, with 0 h levels of cfNDA (crude OR 1.8, 95% CI: 1.2-2.7, $p = 0.007$) and nucleosomes (crude OR 1.7, 95% CI: 1.0-2.2, $p = 0.049$), as well as with 12 h levels of cfDNA (crude OR 1.6, 95% CI: 1.1-2.4, $p = 0.024$), nucleosomes (crude OR 1.7, 95% CI: 1.1-2.5, $p = 0.020$), and H3Cit (crude OR 1.6, 95% CI: 1.1-2.3, $p = 0.029$). Patients in the fourth (7.9, 95% CI: 1.1-56, $p = 0.039$) and fifth (9.0, 95% CI: 1.3-63, $p = 0.027$) H3Cit quintile had significantly higher odds of poor 30 day neurologic function compared to patients in the first quintile. Increased plasma levels of H3Cit, 12 h after admission, are associated with poor 30 day neurologic function in adult OHCA survivors, which may suggest a contribution of NET formation to post-resuscitative brain damage and therefore provide a therapeutic target in the future.

FREE FULL TEXT

Coronary angiographic findings after cardiac arrest in relation to ECG and comorbidity.

Lagedal R(1), Elfwén L(2), Jonsson M(3), Lindgren E(4), Smekal D(5), Svensson L(6), James S(7), Nordberg P(8), Rubertsson S(9).

Abstract

INTRODUCTION: The relations between specific ECG patterns and coronary angiographic findings in cardiac arrest patients with different comorbidities are not properly assessed. More evidence is needed to identify patients with the highest risk for acute coronary artery disease as a cause of the cardiac arrest. This study aims to describe the coronary artery findings after cardiac arrest in relation to ECG and comorbidity. METHOD: A retrospective study of out-of-hospital cardiac arrest patients, with coronary angiography performed within 28 days. ECG on admission, comorbidity, PCI attempts and angiographic findings are described. Data were retrieved from national registries in Sweden. RESULTS: Among 1133 patients with available ECG and angiography information the mean age was 64 years. The rate of shockable rhythm was 79%. The total incidence of any significant stenosis in cardiac arrest

patients without ST-elevation who underwent coronary angiography within 28 days was 71%. The incidence of any stenosis in patients with normal ECG was 62.1% and in patients with LBBB, 59.3%. In patients with ST-depression or RBBB, PCI attempts were made in 47.1% and 42.4% respectively, compared with 33.3% in patients with normal ECG. Among patients without ST-elevation, those with diabetes mellitus and those with initial shockable rhythm respectively, 84.8% and 71.5 had at least one significant stenosis. CONCLUSION: Our study suggests, that evaluation of ECG patterns and comorbidities in out-of-hospital cardiac arrest patients without ST-segment elevation may be important to identify those with a high risk of coronary artery lesions that could benefit from early revascularization.

Optimal timing of coronary intervention in patients resuscitated from cardiac arrest without ST-segment elevation myocardial infarction (NSTEMI): A systematic review and meta-analysis.

Barbarawi M(1), Zayed Y(2), Kheiri B(2), Barbarawi O(3), Al-Abdouh A(4), Dhillon H(2), Rizk F(5), Bachuwa G(2), Alkotob ML(6).

Abstract

OBJECTIVE: Performing immediate coronary angiography (CAG) in patients with a cardiac arrest and a non-ST-elevation myocardial infarction (NSTEMI) remains a highly debated topic. We performed a meta-analysis aiming to evaluate the influence of immediate, delayed, and no CAG in patients with cardiac arrest and NSTEMI. METHODS: A comprehensive literature review of Pubmed/MEDLINE, Cochrane Library, and Embase was performed for all studies that compared immediate CAG to delayed or no CAG in the setting of cardiac arrest and NSTEMI. The primary outcome was long-term mortality and secondary outcomes included short-term mortality and a Cerebral Performance Category (CPC) score of 1-2 at the longest follow-up period. A random-effects model was used to report odds ratios (ORs) with Bayesian 95% credible intervals (CrIs), and ORs with 95% confidence intervals (CIs) for both network and direct meta-analyses, respectively. RESULTS: 11 studies were included in the final analysis: 8 observational, 1 post-hoc analysis and 2 randomized trials, totaling 3,702 patients. The mean age was 63.8 ± 12.8 years with 78% males. We found that immediate and delayed CAG were associated with lower long-term mortality when compared to no CAG (OR 0.21; 95% CrI 0.05-0.82) and (OR 0.11; 95% CrI 0.03-0.43), as well as lower short-term mortality (OR 0.17; 95% CrI 0.04-0.64) and (OR 0.07; 95% CrI 0.01-0.29), respectively. In addition, immediate and delayed CAG were associated with a significantly higher number of patients with a CPC score of 1-2 (OR 4.15; 95% CrI 1.10-16.10) and (OR 4.67; 95% CrI 1.53-15.12), respectively. There were no significant differences between immediate or delayed CAG regarding long-term mortality, short-term mortality, or favorable CPC score. CONCLUSIONS: Among patients who survived cardiac arrest with an NSTEMI, CAG is associated with a higher rate of survival and favorable neurological outcomes compared with no CAG. There were no differences between immediate or delayed strategies.

TARGETED TEMPERATURE MANAGEMENT

Increased Heat Generation in Postcardiac Arrest Patients During Targeted Temperature Management Is Associated With Better Outcomes.

Uber AJ(1)(2), Perman SM(3), Cocchi MN(1)(4), Patel PV(1), Ganley SE(1), Portmann JM(1), Donnino MW(1)(5), Grossestreuer AV(1).

Abstract

OBJECTIVES: Assess if amount of heat generated by postcardiac arrest patients to reach target temperature (Ttarget) during targeted temperature management is associated with outcomes by serving as a proxy for thermoregulatory ability, and whether it modifies the relationship between time to Ttarget and outcomes. DESIGN: Retrospective cohort study. SETTING: Urban tertiary-care hospital. PATIENTS: Successfully resuscitated targeted temperature management-treated adult postarrest patients between 2008 and 2015 with serial temperature data and Ttarget less than or equal to 34°C. INTERVENTIONS: None. MEASUREMENTS AND MAIN RESULTS: Time to Ttarget was defined as time from targeted temperature management initiation to first recorded patient temperature less than or equal to 34°C. Patient heat generation ("heat units") was calculated as inverse of average water temperature × hours between initiation and Ttarget × 100. Primary outcome was neurologic status measured by Cerebral Performance Category score; secondary outcome was survival, both at hospital discharge. Univariate analyses were performed using Wilcoxon rank-sum tests; multivariate analyses used logistic regression. Of 203 patients included, those with Cerebral Performance Category score 3-5 generated less heat before reaching Ttarget (median, 8.1 heat units [interquartile range, 3.6-21.6 heat units] vs median, 20.0 heat units [interquartile range, 9.0-33.5 heat units]; p = 0.001) and reached Ttarget quicker (median, 2.3 hr [interquartile range, 1.5-4.0 hr] vs median, 3.6 hr [interquartile range, 2.0-5.0 hr]; p = 0.01) than patients with Cerebral Performance Category score 1-2. Nonsurvivors generated less heat than survivors (median, 8.1 heat units [interquartile range, 3.6-20.8 heat units] vs median, 19.0 heat units [interquartile range, 6.5-33.5 heat units]; p = 0.001) and reached Ttarget quicker (median, 2.2 hr [interquartile range, 1.5-3.8 hr] vs median, 3.6 hr [interquartile range, 2.0-5.0 hr]; p = 0.01). Controlling for average water temperature between initiation and Ttarget, the relationship between outcomes and time to Ttarget was no longer significant. Controlling for location, witnessed arrest, age, initial rhythm, and neuromuscular blockade use, increased heat generation was associated with better neurologic (adjusted odds ratio, 1.01 [95% CI, 1.00-1.03]; p = 0.039) and survival (adjusted odds ratio, 1.01 [95% CI, 1.00-1.03]; p = 0.045) outcomes. CONCLUSIONS: Increased heat generation during targeted temperature management initiation is associated with better outcomes at hospital discharge and may affect the relationship between time to Ttarget and outcomes.

Targeted Temperature Management for Cardiac Arrest with Nonshockable Rhythm.

Lascarrou JB(1), Merdji H(1), Le Gouge A(1), Colin G(1), Grillet G(1), Girardie P(1), Coupez E(1), Dequin PF(1), Cariou A(1), Boulain T(1), Brule N(1), Frat JP(1), Asfar P(1), Pichon N(1), Landais M(1), Plantefeve G(1), Quenot JP(1), Chakarian JC(1), Sirodot M(1), Legriel S(1), Letheulle J(1), Thevenin D(1), Desachy A(1), Delahaye A(1), Botoc V(1), Vimeux S(1), Martino F(1), Giraudeau B(1), Reignier J(1); CRICS-TRIGGERSEP Group.

Abstract

BACKGROUND: Moderate therapeutic hypothermia is currently recommended to improve neurologic outcomes in adults with persistent coma after resuscitated out-of-hospital cardiac arrest. However, the effectiveness of moderate therapeutic hypothermia in patients with nonshockable rhythms (asystole or pulseless electrical activity) is debated. METHODS: We performed an open-label, randomized, controlled trial comparing moderate therapeutic hypothermia (33°C during the first 24 hours) with targeted normothermia (37°C) in patients with coma who had been admitted to the intensive care unit (ICU) after resuscitation from cardiac arrest with nonshockable rhythm. The primary outcome was survival with a favorable neurologic outcome, assessed on day 90 after randomization with the use of the Cerebral Performance Category (CPC) scale (which ranges from 1 to 5, with higher scores indicating greater disability). We defined a favorable neurologic outcome as a CPC score of 1 or 2. Outcome assessment was blinded. Mortality and safety were also assessed.

RESULTS: From January 2014 through January 2018, a total of 584 patients from 25 ICUs underwent randomization, and 581 were included in the analysis (3 patients withdrew consent). On day 90, a total of 29 of 284 patients (10.2%) in the hypothermia group were alive with a CPC score of 1 or 2, as compared with 17 of 297 (5.7%) in the normothermia group (difference, 4.5 percentage points; 95% confidence interval [CI], 0.1 to 8.9; P = 0.04). Mortality at 90 days did not differ significantly between the hypothermia group and the normothermia group (81.3% and 83.2%, respectively; difference, -1.9 percentage points; 95% CI, -8.0 to 4.3). The incidence of prespecified adverse events did not differ significantly between groups. CONCLUSIONS: Among patients with coma who had been resuscitated from cardiac arrest with nonshockable rhythm, moderate therapeutic hypothermia at 33°C for 24 hours led to a higher percentage of patients who survived with a favorable neurologic outcome at day 90 than was observed with targeted normothermia. (Funded by the French Ministry of Health and others; HYPERION ClinicalTrials.gov number, NCT01994772.).

Malignant Arrhythmias During Induction of Target Temperature Management After Cardiac Arrest.

Adler C(1), Schregel F(2), Heller T(3), Hellmich M(4), Adler J(1), Reuter H(1)(5).

Abstract

The aim of this study was to evaluate the incidence and determinants of malignant arrhythmias (MA) in patients with shock following out-of-hospital cardiac arrest (OHCA) treated with targeted temperature management. Risk factors for the development of MA were prospectively analyzed in patients after OHCA. MA were defined as ventricular tachycardia or fibrillation with a duration >30 seconds, which had to be terminated by defibrillation. All patients were treated with therapeutic hypothermia for 24 hours. Demographics, OHCA details, interventions, and intensive care unit (ICU) treatment were recorded. A total of 55 patients were included, 11 (20%) of whom developed MA during the ICU stay. All MA occurred within the first 18 hours after admission. Patients who developed MA showed a stronger decrease in body temperature (Δ -2.4°C ± 0.8°C vs. Δ -1.3°C ± 1.3°C; p = 0.016) and in serum potassium levels (Δ -0.9 ± 1 mmol/L vs. Δ -0.3 ± 0.6 mmol/L; p = 0.037) during the cooling period compared with patients without MA. In the multivariable analysis, fast temperature decline as well as lower potassium levels were associated with MA. In addition, higher number of shocks during resuscitation and higher ICU epinephrine use were independent predictors of MA in patients with OHCA. The use of epinephrine as well as hypokalemia in context with intense cooling may increase the incidence of MA in patients with shock after cardiac arrest. Therefore, these therapeutic strategies should be applied with caution in this vulnerable group of patients.

ELECTROFISIOLOGIA I DESFIBRIL·LACIÓ

Availability of automated external defibrillators in Hamilton, New Zealand.

O'Callaghan PA(1), Swampillai J(2), Stiles MK(3).

Abstract

BACKGROUND: Last year, there were 2,000 out-of-hospital cardiac arrests (OHCA) in New Zealand, 74% received CPR but only 5.1% accessed an automated external defibrillator (AED). The average survival rate of OHCA is 13%. The aim of this study was to visit all 50 AED locations shown on www.hamiltoncentral.co.nz to assess their true availability and visibility to the public in the event of an OHCA. METHOD: All premises were visited and the first staff member encountered was asked if they were aware an AED was onsite, its location, hours of availability, if restricted access applied and whether it had been used. RESULTS: Of the 50 locations, three sites no longer exist and two AEDs were listed twice. Therefore, only 45 AEDs exist. Two sites had grossly inaccurate locations. Three AEDs (7%) were continuously available. Nine AEDs were accessible after 6pm at least one day of the week. Thirteen AEDs were available on weekends; however, five required swipe card access. None of the AEDs were located outdoors. CONCLUSION: Far fewer than 50 listed AEDs are freely available to the public, especially after 6pm and on weekends. Lack of signposting and restrictions to access would lead to delayed defibrillation. This important health issue needs addressing.

PEDIATRIA

Global epidemiology of pediatric cardiopulmonary resuscitation.

Shimoda-Sakano TM(1), Schvartsman C(2), Reis AG(3).

Abstract

OBJECTIVE: To analyze the main epidemiological aspects of prehospital and hospital pediatric cardiopulmonary resuscitation and the impact of scientific evidence on survival. SOURCE OF DATA:

This was a narrative review of the literature published at PubMed/MEDLINE until January 2019 including original and review articles, systematic reviews, meta-analyses, annals of congresses, and manual search of selected articles. SYNTHESIS OF DATA: The prehospital and hospital settings have different characteristics and prognoses. Pediatric prehospital cardiopulmonary arrest has a three-fold lower survival rate than cardiopulmonary arrest in the hospital setting, occurring mostly at home and in children under 1 year. Higher survival appears to be associated with age progression, shockable rhythm, emergency medical care, use of automatic external defibrillator, high-quality early life support, telephone dispatcher-assisted cardiopulmonary resuscitation, and is strongly associated with witnessed cardiopulmonary arrest. In the hospital setting, a higher incidence was observed in children under 1 year of age, and mortality increased with age. Higher survival was observed with shorter cardiopulmonary resuscitation duration, occurrence on weekdays and during daytime, initial shockable rhythm, and previous monitoring. Despite the poor prognosis of pediatric cardiopulmonary resuscitation, an increase in survival has been observed in recent years, with good neurological prognosis in the hospital setting. CONCLUSIONS: A great progress in the science of pediatric cardiopulmonary resuscitation has been observed, especially in developed countries. The recognition of the epidemiological aspects that influence cardiopulmonary resuscitation survival may direct efforts towards more effective actions; thus, studies in emerging and less favored countries remains a priority regarding the knowledge of local factors.

Association of Duration of Hypotension With Survival After Pediatric Cardiac Arrest.

Laverriere EK(1), Polansky M(1)(2), French B(3), Nadkarni VM(1), Berg RA(1), Topjian AA(1).

Abstract

OBJECTIVES: To evaluate the association of a single episode of hypotension and burden of hypotension with survival to hospital discharge following resuscitation from pediatric cardiac arrest. DESIGN: Retrospective cohort study. SETTING: Single-center PICU. PATIENTS: Patients between 1 day and 18 years old who had a cardiac arrest, received chest compressions for more than 2 minutes, had return of spontaneous circulation for more than 20 minutes, and survived to receive postresuscitation care in the ICU. INTERVENTIONS: None. MEASUREMENT AND MAIN RESULTS:

One-hundred sixteen patients were evaluable. Hypotension, defined as systolic blood pressure less than the fifth percentile for age and sex, occurred in 37 patients (32%) within the first 6 hours and 64 (55%) within 72 hours of postresuscitation ICU care. There was no significant difference in survival to discharge for patients who had a single episode of hypotension within 6 hours (51% vs 69%; p = 0.06) or within 72 hours (56% vs 73%; p = 0.06). Burden of hypotension was defined as the percentage of hypotension measurements that were below the fifth percentile. After controlling for patient and cardiac arrest event characteristics, a higher burden of hypotension within the first 72 hours of ICU postresuscitation care was associated with decreased discharge survival (adjusted odds ratio = 0.67 per 10% increase in hypotension burden; 95% CI, 0.48-0.86; p = 0.006). CONCLUSIONS: After successful resuscitation from pediatric cardiac arrest, systolic hypotension was common (55%). A higher burden of postresuscitation hypotension within the first 72 hours of ICU postresuscitation care was associated with significantly decreased discharge survival, after accounting for potential confounders including number of doses of epinephrine, arrest location, and arrest etiology due to airway obstruction or trauma.

RECERCA EXPERIMENTAL

Worsened survival in the head-up tilt position cardiopulmonary resuscitation in a porcine cardiac arrest model.

Park YJ(1), Hong KJ(2), Shin SD(2), Kim TY(3), Ro YS(4), Song KJ(2), Ryu HH(5).

Abstract

OBJECTIVE: Head elevation at an angle of 30° during cardiopulmonary resuscitation (CPR) was hemodynamically beneficial compared to supine position in a previous porcine cardiac arrest experimental study. However, survival benefit of head-up elevation during CPR has not been clarified. This study aimed to assess the effect of head-up tilt position during CPR on 24-hour survival in a porcine cardiac arrest experimental model. METHODS: This was a randomized experimental trial using female farm pigs (n=18, 42±3 kg) sedated, intubated, and paralyzed on a tilting surgical table. After surgical preparation, 15 minutes of untreated ventricular fibrillation was induced. Then, 6 minutes of basic life support was performed in a position randomly assigned to either head-up tilt at 30° or supine with a mechanical CPR device, LUCAS-2, and an impedance threshold device, followed by 20 minutes of advanced cardiac life support in the same position. Primary outcome was 24-hour survival, analyzed by Fisher exact test. RESULTS: In the 8 pigs from the head-up tilt position group, one showed return of spontaneous circulation (ROSC); all eight pigs expired within 24 hours. In the eight pigs from the supine position group, six had the ROSC; six pigs survived for 24 hours and two expired. The head-up position group showed lower 24-hour survival rate and lower ROSC rate than supine position group (P<0.01). CONCLUSION: The use of head-up tilt position with 30 degrees during CPR showed lower 24-hour survival than the supine position.

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CASE REPORTS

Stellate Ganglion Nerve Block by Point-of-Care Ultrasonography for Treatment of Refractory Infarction-Induced Ventricular Fibrillation.

Margus C(1), Correa A(2), Cheung W(3), Blaikie E(3), Kuo K(3), Hockensmith A(3), Kinas D(4), She T(3).

Abstract

Stellate ganglion blockade has been previously suggested as a treatment option for intractable ventricular arrhythmia; however, its use in emergency department management of pulseless arrest with shockable rhythm has not been described. We report the case of a 65-year-old man brought in by ambulance who complained of chest pain and received an out-of-hospital ECG suggestive of anterior-wall ST-segment elevation myocardial infarction. Shortly after arrival, the patient became unresponsive, with no palpable pulse, and was found to be in ventricular fibrillation. The patient's ventricular fibrillation persisted despite repeated attempts at standard and double sequential defibrillation, multiple rounds of epinephrine, and amiodarone, magnesium, and bicarbonate. After these interventions were exhausted, a stellate ganglion blockade was conducted after an ultrasonographically guided paratracheal approach. Return of spontaneous circulation was noted after the next defibrillation and pulse check, achieved after a total of 42 minutes of active cardiopulmonary resuscitation. The patient ultimately had both sufficient neurologic activity and hemodynamic recovery for emergency percutaneous

coronary intervention of the culprit left anterior descending artery. This positive outcome is multifactorial but suggests sympathetic blockade as a possible adjunctive therapy in the setting of sustained pulseless ventricular storm.

2. Case Rep Pediatr. 2019 Sep 9;2019:5057390. doi: 10.1155/2019/5057390. eCollection 2019.

A Loading Dose of IV Salbutamol in an Adolescent with Severe Acute Asthma and Cardiac Arrest.

Boeschoten SA(1), van der Crabben RS(2)(3), Boehmer ALM(4), de Hoog M(1), Buysse CMP(1).

Abstract

Severe acute asthma (SAA) can lead to respiratory failure and can be fatal. For rational use of intravenous (IV) bronchodilators, evidence regarding the pharmacokinetics and pharmacodynamics is lacking in children. The use of a loading dose IV salbutamol is not mentioned in any international guideline, and its use varies greatly between PICUs worldwide. We describe a 17-year-old Caucasian female with SAA resulting in an out-of-hospital cardiac arrest. After basic life support and return of spontaneous circulation, the ambulance administered oxygen, inhaled salbutamol, IV magnesium sulphate, and systemic corticosteroids. Despite of this, she was still in severe respiratory distress. Therefore, a loading dose of IV salbutamol was administered, after which an immediate improvement was observed. Having a loading dose of IV salbutamol available for emergency medical services use for SAA in children with life-threatening SAA in the out-of-hospital setting is important to consider. Further study on the dose and the effect of a loading dose IV salbutamol in children with SAA is necessary.

FREE FULL TEXT

3. Medicine (Baltimore). 2019 Sep;98(38):e17212. doi: 10.1097/MD.0000000000017212.

Anomalous origin of left coronary arteries from the pulmonary artery in an asymptomatic adult: An autopsy case report.

Al Shaarani M, Alzubaidi Y, Jin L.

Abstract

RATIONALE: Anomalous Origin of Left Coronary Arteries from the Pulmonary Artery (ALCAPA), also known as Bland-White-Garland (BWG), is a rare form of coronary artery anomaly that is usually discovered in the first few months of life. Only rarely can patients with this anomaly reach adulthood without symptoms. PATIENT CONCERNS: A 28-year-old female was witnessed suddenly collapse with a seizure-like episode by her colleagues at work. DIAGNOSIS AND INTERVENTION: Routine cardiopulmonary resuscitation was performed by emergency medical service technologists. The patient was unable to be revived. Postmortem examination revealed the patient had ALCAPA with a focal chronic ischemic injury of the left ventricle. Moreover, a high take-off of the right coronary artery was also discovered. OUTCOMES: The patient passed away due to ALCAPA. The mechanism of death was cardiac arrhythmia being triggered by myocardial ischemic changes. LESSONS: In the rare cases where ALCAPA manifests in an asymptomatic adult, the mortality rate is very high. This case demonstrates the importance of awareness of such patients living under the tremendous risk of sudden cardiac death.

FREE FULL TEXT

RCP / COMPRESSIONS TORÀCIQUES MECÀNIQUES

Predictors of Out of Hospital Cardiac Arrest Outcomes in Pre-Hospital Settings; a Retrospective Cross-sectional Study.

Navab E(1), Esmaeili M(1), Poorkhorshidi N(2), Salimi R(3), Khazaei A(4), Moghimbeigi A(5).

Abstract

INTRODUCTION: Different potential factors can affect the outcomes of Out of Hospital Cardiac Arrest (OHCA). The present study aimed to identify important factors contributing to the Return of Spontaneous Circulation (ROSC) and Survival to Hospital Discharge (SHD) in these patients. METHODS: This cross-sectional study was conducted on all the OHCA patients who underwent Cardiopulmonary Resuscitation (CPR) in emergency medical service (EMS) of Hamedan province during 2016-2017. All the relevant data were retrieved from three sources, according to Utstein's style. In addition, univariate and multivariate logistic regressions were employed to identify predictive factors of ROSC and SHD using SPSS software, version 20. RESULTS: Among the 3214 eligible patients whose data were collected, most OHCA patients were female (59.7%) with the mean age of 58 years. Moreover, the majority of OHCAs (77.8%) occurred at home during 8pm-8am (65.1%) and about 26.3% of OHCAs were witnessed, with only 5.1% bystander-initiated CPR. Furthermore, the median ambulance response time and CPR duration were 6.0 and 20 minutes, respectively. Overall, ROSC and SHD success rates were 8.3 and 4.1%, respectively. Bystander CPR was found to be the most effective predicting factor for the success rate of ROSC (AOR=3.26, P<0.001) and SHD (AOR=3.04, P<0.001) after adjusting for the Utstein variables including the patients' age, gender, cardiac disease history, arrest time, CPR duration, response time, being witnessed, bystander CPR, and endotracheal intubation (ETI). CONCLUSION: The overall success rates of ROSC and SHD were 8.3% and 4.1%, respectively. The age, ambulance response time, CPR duration, and cardiac disease history were negatively associated with the outcomes of ROSC and SHD, while being witnessed, bystander CPR, ETI, and initial shockable rhythm were positively related to both of the above-mentioned outcomes.

FREE FULL TEXT

Prevalence and Outcomes of Sudden Cardiac Arrest in a University Hospital in the Western Region, Saudi Arabia.

Alzahrani AH(1), Alnajjar MF(2), Alshamarni HM(1), Alshamrani HM(1), Bakhsh AA(1).

Abstract

BACKGROUND: Sudden cardiac arrest (SCA) is a major cause of mortality, yet its epidemiological and outcome data in hospitals from Saudi Arabia are limited. OBJECTIVES: This study aimed to evaluate the prevalence, risk factors and outcomes of SCA in a teaching hospital in Jeddah, Saudi Arabia. METHODS: This retrospective study included all patients aged ≥18 years with SCA who were resuscitated at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, between January 1 and December 31, 2016. Data were retrieved from the hospital medical records as flow sheets designed in accordance with the Utstein-style recommendations. Factors relating to mortality were analyzed using descriptive analyses and chi-square test. RESULTS: A total of 429 cases of SCA met the inclusion criteria, and its prevalence was 7.76 cases/1000 adult hospital admission. Of these, 61.3% were male, and the mean age was 58.4 years, with 36.6% aged >65 years. Only 3.5% were outside-hospital cardiac arrests. The most common initial rhythm was pulseless electrical activity/asystole (93.2%), while ventricular tachycardia/ventricular fibrillation was documented in only 29 cases (6.8%). The overall rate of return to spontaneous circulation (ROSC) was 56.2%, and 56.8% in cases of in-hospital cardiac arrest (IHCA). Patients with SCA due to sepsis had significantly increased mortality (*P* < 0.000; odds ratio [OR] = 0.24 [0.12-0.47 95% confidence interval [CI]]), while those with SCA due to respiratory causes had significantly better survival outcomes (*P* = 0.001; OR = 2.3 [1.5-3.8 95% CI]). No significant differences in outcomes were found between other risk factors, including cardiac causes. CONCLUSION: In this population, the prevalence of SCA in adults was higher than reported in many similar studies. Further, sepsis was found to affect the survival rate. Although the rate of ROSC for IHCA patients was favorable compared with other

studies, it is relatively poor. This finding signifies the need to identify and control risk factors for SCA to improve survival.

FREE FULL TEXT

REGISTRES, REVISIONS I EDITORIALS

Epinephrine in Out-of-Hospital Cardiac Arrest: What Is the Role of the Timing Interval?

Mohr NM(1), Faine B(2).

NO ABSTRACT AVAILABLE

ACR INTRAHOSPITALÀRIA

Annual Incidence of Adult and Pediatric In-Hospital Cardiac Arrest in the United States

Holmberg MJ(1)(2), Ross CE(3), Fitzmaurice GM(4)(5)(6), Chan PS(7), Duval-Arnould J(8), Grossestreuer AV(2), Yankama T(2), Donnino MW(2)(9), Andersen LW(1)(2); American Heart Association's Get With The Guidelines– Resuscitation Investigators.

Abstract

BACKGROUND: Previous incidence estimates may no longer reflect the current public health burden of cardiac arrest in hospitalized adult and pediatric patients across the United States. The aim of this study was to estimate the contemporary annual incidence of in-hospital cardiac arrest in adults and children across the United States and to describe trends in incidence between 2008 and 2017. METHODS AND RESULTS: Using the Get With The Guidelines– Resuscitation registry, we developed a negative binomial regression model to estimate the incidence of index pulseless in-hospital cardiac arrest based on hospital-level characteristics. The model was used to predict the number of in-hospital cardiac arrests in all US hospitals, using data from the American Hospital Association Annual Survey. We performed separate analyses for adult (≥18 years) and pediatric (<18 years) cardiac arrests. Additional analyses were performed for recurrent cardiac arrests and pediatric patients requiring cardiopulmonary resuscitation for poor perfusion (nonpulseless events). The average annual incidence of in-hospital cardiac arrest in the United States was estimated at 292 000 (95% prediction interval, 217 600–503 500) adult and 15 200 pediatric cases, of which 7100 (95% prediction interval, 4400–9900) cases were pulseless cardiac arrests and 8100 (95% prediction interval, 4700–11 500) cases were nonpulseless events. The rate of adult cardiac arrests increased over time, while pediatric events remained more stable. When including both index and recurrent inhospital cardiac arrests, the average annual incidence was estimated at 357 900 (95% prediction interval, 247 100–598 400) adult and 19 900 pediatric cases, of which 8300 (95% prediction interval, 4900–11 200) cases were pulseless cardiac arrests and 11 600 (95% prediction interval, 6400–16 700) cases were nonpulseless events. CONCLUSIONS: There are ≈292 000 adult in-hospital cardiac arrests and 15 200 pediatric in-hospital events in the United States each year.

This study provides contemporary estimates of the public health burden of cardiac arrest among hospitalized patients.

CAUSES DE L'ACR

Characteristics of subjects with alcoholic cardiomyopathy and sudden cardiac death.

Hietanen S(1)(2), Herajärvi J(2), Junttila J(3), Pakanen L(4)(5), Huikuri HV(3), Liisanantti J(6)(2).

Abstract

OBJECTIVE: To study social and clinical characteristics of victims of sudden cardiac death (SCD) due to alcoholic cardiomyopathy (ACM). METHODS: The study population comprised a subset of Fingesture cohort. All subjects were verified SCD victims determined to have ACM as cause of death in medico-legal autopsy between 1998 and 2017 in Northern Finland. The Finnish Population Register Centre provided SCD victims' last place of residence. Population data of residential area were obtained from Statistics Finland. RESULTS: From a total of 5869 SCD victims in Fingesture cohort, in 290 victims the cause of SCD was ACM (4.9%; median age 56 (50-62) years; 83% males). In 64 (22.1%) victims, the diagnosis of cardiac disease was made prior to death and in 226 (77.9%) at autopsy. There were no significant differences in autopsy findings between victims with or without known cardiac diagnosis, but steatohepatitis (94.5%) and liver cirrhosis (64,5%) were common in both groups. Alcoholism was more often recorded in the known cardiac disease group (64.1% vs 47.3%, p=0.023). Majority were included in the working age population (ie, under 65 years) (54.8% and 53.1%, p=0.810). In high-income communities, 28.8% of ACM SCD victims had previously diagnosed cardiac disease, the proportion in the middle-income and low-income communities was 18.6% (p=0.05). CONCLUSIONS: Majority of SCD victims due to ACM did not have previously diagnosed cardiac disease, but documented risk consumption of alcohol was common. This emphasises the importance of routine screening of alcohol consumption and signs of cardiomyopathy in heavy alcohol users in primary healthcare.

MONITORATGE CERERBRAL

Association between somatosensory evoked potentials and EEG in comatose patients after cardiac arrest.

Glimmerveen AB(1), Ruijter BJ(2), Keijzer HM(3), Tjepkema-Cloostermans MC(4), van Putten MJAM(4), Hofmeijer J(5).

Abstract

OBJECTIVE: To analyze the association between SSEP results and EEG results in comatose patients after cardiac arrest, including the added value of repeated SSEP measurements. METHODS: Continuous EEG was measured in 619 patients during the first 3-5 days after cardiac arrest. SSEPs were recorded daily in the first 55 patients, and on indication in later patients. EEGs were visually classified at 12, 24, 48, and 72 h after cardiac arrest, and at the time of SSEP. Outcome at 6 m was dichotomized as good (Cerebral Performance Category 1-2) or poor (CPC 3-5). SSEP and EEG results were related to outcome. Additionally, SSEP results were related to the EEG patterns at the time of SSEP. RESULTS: Absent SSEP responses and suppressed or synchronous EEG on suppressed background ≥24 h after cardiac arrest were invariably associated with poor outcome. SSEP and EEG identified different patients with

poor outcome (joint sensitivity 39% at specificity 100%). N20 responses were always preserved in continuous traces at >8 Hz. Absent SSEPs did not re-emerge during the first five days. CONCLUSIONS: SSEP and EEG results may diverge after cardiac arrest. SIGNIFICANCE: SSEP and EEG together identify more patients without chance of recovery than one of these alone.

Imaging for Neuroprognostication After Cardiac Arrest: Systematic Review and Meta-analysis.

Lopez Soto C(1)(2)(3), Dragoi L(1)(2), Heyn CC(4), Kramer A(5), Pinto R(1), Adhikari NKJ(1)(2), Scales DC(6)(7).

Abstract

BACKGROUND: Predicting neurological outcome in comatose survivors of cardiac arrest relies on clinical findings, radiological and neurophysiological test results. To evaluate the predictive accuracy of brain computed tomography (CT) and magnetic resonance imaging (MRI) for prognostication of neurological outcomes after cardiac arrest. METHODS: We searched MEDLINE (database inception to August 2018) and included all observational cohort studies or randomized controlled trials including adult (16 years or older) survivors of cardiac arrest which evaluated the diagnostic accuracy of CT or MRI for predicting neurologic outcome or mortality. Study quality was assessed using the Quality Assessment of Diagnostic Accuracy Studies 2 tool. All review stages were conducted independently by 2 reviewers, and where possible data were pooled using bivariate meta-analysis. The main outcome was to evaluate the of accuracy of CT and MRI in neuroprognostication of patients after cardiac arrest. RESULTS: We included 44 studies that examined brain CT (n = 24) or MRI (n = 21) in 4008 (n per study, 9-398) patients. Decreased grey to white matter ratio on CT (20 studies) was useful for predicting poor neurological outcome (sensitivity 0.44, 95% CI 0.29-0.60; specificity 0.97, 95% CI 0.93-0.99; positive likelihood ratio [LR+] 13.8, 95% CI 6.9-27.7). Similarly, diffusion-weighted imaging (DWI) on MRI (16 studies; sensitivity 0.77, 95% CI 0.65-0.85; specificity 0.92, 95% CI 0.85-0.96; LR+ 9.2, 95% CI 5.2-16.4) and DWI and fluid-attenuated inversion recovery (FLAIR) MRI (4 studies, sensitivity 0.70, 95% CI 0.43-0.88; specificity 0.95, 95% CI 0.79-0.99; LR+ 13.4, 95% CI 3.5-51.2) were useful for predicting poor neurological outcomes. We found marked heterogeneity in timing of radiological examinations and neurological assessments relative to the cardiac arrest. CONCLUSION: Decreased grey to white matter ratio on CT and DWI or DWI and FLAIR on MRI are useful adjuncts for predicting poor early neurological outcome after cardiac arrest.

ORGANITZACIÓ I ENTRENAMENT

Randomised controlled trial of simulation-based education for mechanical cardiopulmonary resuscitation training.

Coggins AR(1)(2), Nottingham C(2), Byth K(2), Ho KR(2), Aulia FA(1), Murphy M(1), Shetty AL(1)(2), Todd A(3), Moore N(2)(4).

INTRODUCTION: Mechanical cardiopulmonary resuscitation (M-CPR) is increasingly used in the management of cardiac arrest. There are no previously reported randomised studies investigating M-CPR training. This study of newly trained M-CPR providers hypothesised that a brief simulation-based intervention after 4 months would improve M-CPR performance at 6 months.

METHODS: This study used a simulated 'in situ' cardiac arrest model. The M-CPR device used was a proprietary Lund University Cardiac Assist System 3 machine (Physio Control, Redmond, Washington, USA). Standardised

baseline training was provided to all participants. Following training, baseline performance was assessed. The primary outcome measure was the time taken to initiate M-CPR and

the secondary outcome was performance against a checklist of errors. Participants were then randomised to intervention group (simulation training) or control group (routine clinical use of M-CPR). After 6 months the outcome measures were reassessed. Comparative statistical tests used an intention-to-treat analysis. RESULTS: 112 participants were enrolled. The intervention group (n=60) and control group (n=52) had similar demographic characteristics. At the 6-month assessment, median time to M-CPR initiation was 27.0 s (IQR 22.0-31.0) in the intervention group and 31.0 s (IQR 25.6-46.0) in the control group (p=0.003). The intervention group demonstrated fewer errors compared with controls at 6 months (p<0.001) CONCLUSION: In this randomised study of approaches to M-CPR training, providers receiving additional simulation-based training had higher retention levels of M-CPR skills. Therefore, when resuscitation skills are newly learnt, provision follow-up training should be an important consideration.

Effectiveness of dispatcher instructions-dependent or independent bystander cardiopulmonary resuscitation on neurological survival among patients with out-of-hospital cardiac arrest.

Hatakeyama T(1), Kiguchi T(2), Kobayashi D(2), Nakamura N(3), Nishiyama C(4), Hayashida S(5), Kiyohara K(6), Kitamura T(7), Kawamura T(2), Iwami T(8).

Abstract

BACKGROUND: We evaluated the association between survival and bystandercardiopulmonary resuscitation (CPR) with or without dispatcher instructions (DI) considering the time from emergency call receipt by the dispatch center to emergency medical services (EMS) personnel's contact with the patient (i.e. time to EMS arrival). METHODS: This prospective study conducted in Osaka City, Japan, from 2009 to 2015 included patients with medical cause-related out-of-hospital cardiac arrest who were ≥18 years old. The primary outcome was one-month favorable neurological survival. Using multiple logistic regression models, the adjusted odds ratios (AOR) of independent and DI-dependent CPR for the primary outcome were compared with no CPR. Adjustments were made for patients' age, sex, activities of daily living before the cardiac arrest, year of cardiac arrest, location, presence or absence of witnesses, etiology of cardiac arrest, and the time from EMS contact with the patient to patient's arrival at the hospital. The effective estimated "time to EMS arrival" was also calculated. RESULTS: For analyses 10,925 individuals were eligible. Independent CPR had a significantly higher one-month favorable neurological survival than no CPR whereas there was no significant difference between DI-dependent CPR and no CPR (AOR, 1.90 [1.47-2.46] and 1.16 [0.91-1.47], respectively). The estimated "time to EMS arrival" for a one-month favorable neurological survival after independent CPR was ≤13min. CONCLUSIONS: Bystander CPR that did not need DI was associated with significantly higher one-month favorable neurological survival than no CPR, with an effective estimated "time to EMS arrival" of ≤13min.

Effect of team-based cardiopulmonary resuscitation training for emergency medical service providers on pre-hospital return of spontaneous circulation in out-of-hospital cardiac arrest patients.

Park JH(1), Moon S(2), Cho H(1), Ahn E(1), Kim TK(3), Bobrow BJ(4).

Abstract

OBJECTIVE: This study aimed to assess whether team-based cardiopulmonary resuscitation (CPR) training for emergency medical service (EMS) providers improved the pre-hospital return of spontaneous circulation (ROSC) rates of non-traumatic adult out-of-hospital cardiac arrest (OHCA) patients. METHODS: This was a before-and-after study an evaluating educational intervention for community EMS providers, which was conducted in Gyeonggi

province, South Korea. Team-based CPR training was conducted from January to March 2016 for every level 1 and level 2 EMS provider in the study area. Non-traumatic EMS treated OHCA patients from July to December 2015 and from July to December 2016 were enrolled and used for the analysis. The primary outcome was pre-hospital ROSC rates before and after the training period. A multivariable logistic regression model with an interaction term (period × dispatch type) was used to determine the adjusted odds ratios (aORs) according to the dispatch type (single vs. multi-tiered). RESULTS: Of the 2,125 OHCA cases included, 1,072 (50.4%) and 1,053 (49.6%) were categorized in the before- and after-training groups, respectively, and the pre-hospital ROSC rates were 6.6% and 12.6%, respectively. In the multivariable logistic regression analysis, the aOR for pre-hospital ROSC was 2.07 (95% CI, 1.32-3.25) in the after-training period. In the interaction model (period × type of dispatch), the aORs for pre-hospital ROSC were 2.00 (95% CI, 1.01-3.98) and 2.13 (95% CI, 1.20-3.79) in the single- and multi-tiered dispatch groups, respectively, during the after-training period. CONCLUSION: Team-based CPR training for EMS providers in a large community EMS system improved the pre-hospital ROSC rates of OHCA patients.

CURES POST-RCE

1. J Clin Med. 2019 Sep 18;8(9). pii: E1480. doi: 10.3390/jcm8091480.

Association between Achievement of Estimated Average Glucose Level and 6-Month Neurologic Outcome in Comatose Cardiac Arrest Survivors: A Propensity Score-Matched Analysis.

Jung YH(1), Lee BK(2), Jeung KW(3), Lee DH(4), Lee HY(5), Cho YS(6), Youn CS(7), Park JS(8), Min YI(9).

Abstract

We investigated whether achieving estimated average glucose (EAG) levels versus achieving standard glucose levels (180 mg/dL) was associated with neurologic outcome in cardiac arrest survivors. This single-center retrospective observational study included adult comatose cardiac arrest survivors undergoing therapeutic hypothermia (TH) from September 2011 to December 2017. EAG level was calculated using HbA1c obtained after the return of spontaneous circulation (ROSC), and the mean glucose level during TH was calculated. We designated patients to the EAG or standard glucose group according to whether the mean blood glucose level was closer to the EAG level or 180 mg/dL. Patients in the EAG and standard groups were propensity score- matched. The primary outcome was the 6-month neurologic outcome. The secondary outcomes were hypoglycemia (≤70 mg/dL) and serum neuron-specific enolase (NSE) at 48 h after ROSC. Of 384 included patients, 137 (35.7%) had a favorable neurologic outcome. The EAG group had a higher favorable neurologic outcome (104/248 versus 33/136), higher incidence of hypoglycemia (46/248 versus 11/136), and lower NSE level. After propensity score matching, both groups had similar favorable neurologic outcomes (24/93 versus 27/93) and NSE levels; the EAG group had a higher incidence of hypoglycemia (21/93 versus 6/93). Achieving EAG levels was associated with hypoglycemia but not neurologic outcome or serum NSE level.

FREE FULL TEXT

2. Resuscitation. 2019 Sep 23. pii: S0300-9572(19)30631-8. doi: 10.1016/j.resuscitation.2019.09.020. [Epub ahead of print]

Elimination of Glutamate using CRRT for 72 hours in patients with post-cardiac arrest syndrome: a randomized clinical pilot trial.

Nee J(1), Jörres A(2), Krannich A(3), Leithner C(4), Schroeder T(1), Munk AL(1), Enghard P(1), Moore C(5), Steppan S(5), Storm C(6).

Abstract

AIM: Glutamine and glutamate are major mediators of secondary brain cell death during post-cardiac arrest syndrome. As there is an equilibrium between brain tissue and plasma concentrations of glutamine and glutamate, their elimination from systemic circulation by extracorporeal blood purification may ultimately lead to reduced secondary cell death in the brain. We hypothesized that systemic glutamine and glutamate can be significantly reduced by continuous venovenous hemodiafiltration (CVVHDF). METHODS: This was a prospective, randomized clinical trial in post cardiac-arrest survivors evaluating standard of care or additional CVVHDF over 72 hours immediately after admission. Glutamine and glutamate plasma concentrations were analyzed at eight time points in both groups. Primary endpoint was reduction of glutamine and glutamate plasma concentrations. The trial has been registered at clinical trial.gov (NCT02963298). RESULTS: In total, 41 patients were randomized over a period of 12 months (control n = 21, CVVHDF n = 20). The primary aim reduction of glutamine and glutamate plasma concentrations by CVVHDF, was not achieved; both groups-maintained concentrations within a normal range over the study period (glutamate: 4.7-11.1 mg/dL; glutamine: 0.2-3.7 mg/dL). However, post-filter concentrations of glutamine and glutamate in CRRT patients were significantly decreased as compared to pre-filter concentrations (glutamate: pre-filter median 8.85 mg/dl IQR 7.1-9.6; post-filter 0.95 mg/dl IQR 0.5-2; p < 0.001; glutamine: pre-filter 0.7 mg/dl IQR 0.6-1; post-filter 0.2 mg/dl IQR 0-0.2; p < 0.001). CONCLUSION: In this trial, CVVHDF was not able to statistically significantly lower systemic plasma glutamine and glutamate levels. Post-cardiac arrest patients had plasma glutamine and glutamate levels within the normal range.

Subphenotypes of Cardiac Arrest Patients Admitted to Intensive Care Unit: a latent profile analysis of a large critical care database.

Zhang Z(1), Yao M(2), Ho KM(3), Hong Y(4).

Abstract

Cardiac arrest (CA) may occur due to a variety of causes with heterogeneity in their clinical presentation and outcomes. This study aimed to identify clinical patterns or subphenotypes of CA patients admitted to the intensive care unit (ICU). The clinical and laboratory data of CA patients in a large electronic healthcare database were analyzed by latent profile analysis (LPA) to identify whether subphenotypes existed. Multivariable Logistic regression was used to assess whether mortality outcome was different between subphenotypes. A total of 1,352 CA patients fulfilled the eligibility criteria were included. The LPA identified three distinct subphenotypes: Profile 1 (13%) was characterized by evidence of significant neurological injury (low GCS). Profile 2 (15%) was characterized by multiple organ dysfunction with evidence of coagulopathy (prolonged aPTT and INR, decreased platelet count), hepatic injury (high bilirubin), circulatory shock (low mean blood pressure and elevated serum lactate); Profile 3 was the largest proportion (72%) of all CA patients without substantial derangement in major organ function. Profile 2 was associated with a significantly higher risk of death (OR: 2.09; 95% CI: 1.30 to 3.38) whilst the mortality rates of Profiles 3 was not significantly different from Profile 1 in multivariable model. LPA using routinely collected clinical data could identify three distinct subphenotypes of CA; those with multiple organ failure were associated with a significantly higher risk of mortality than other subphenotypes. LPA profiling may help researchers to identify the most appropriate subphenotypes of CA patients for testing effectiveness of a new intervention in a clinical trial.

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TARGETED TEMPERATURE MANAGEMENT

Warming and cooling device using thermoelectric Peltier elements tested on male mice.

Madrahimov N(1), Natanov R(1), Khalikov A(1), Boyle EC(1)(2), Jonigk D(3), Knoefel AK(1), Siemeni T(1), Haverich A(1).

Abstract

Hypothermia is a treatment strategy for different clinical conditions and an essential part of cardiopulmonary bypass in complex cardiac procedures. Clinically, cooling patients is achieved via a mattress and heat exchanger integrated into a membrane oxygenator connected to a waterbed using a refrigerator system based on volatile and toxic liquids. Peltier elements are known as environmentally friendly thermoelectric generators that enable rapid warming and cooling. In this paper, we describe the construction of a novel device for rapid and precise control of mouse warming and cooling using thermoelectric Peltier elements. Six male BALB/c mice were subjected to deep hypothermia and were rewarmed under full physiological monitoring. After rewarming, all animals were observed for two hours, and pathology was evaluated in several organs. All animals tolerated the rapid cooling process well and remained active after rewarming. Temperature-relevant changes were seen via electrocardiography, with heart-rate patterns showing a strong linear correlation to body temperature. No myocardial ischaemia was seen. However, two animals experienced bradycardic atrial fibrillation which spontaneously converted to normal sinus rhythm during rewarming. No histological damage was seen in the heart, liver, kidney or lungs. Our device can effectively be used for heat shock and hypothermia studies in mice, and we foresee no obstacles for its application to other small rodents such as hamsters and young rats. In comparison to known experimental and clinical methods of hypothermia, our device is environmentally friendly, cost-effective and easy to handle, allowing precise control and maintenance of body temperatures ranging from 18°C to 42°C.

EXTRACORPOREAL LIFE SUPPORT

Prolonged cardiopulmonary resuscitation and low flow state are not contraindications for extracorporeal support.

Deshpande SR(1)(2), Vaiyani D(1), Cuadrado AR(1), McKenzie ED(3), Maher KO(1).

Abstract

Outcomes of out-of-hospital cardiac arrest are poor irrespective of the patient age group and circumstances. Survival to discharge after out-of-hospital arrest in children is less than 10%. Use of extracorporeal cardiopulmonary resuscitation is increasing and has been shown to improve outcomes in some situations. However, the candidacy for such augmentation is based on patient selection, institutional practices, and availability of an extracorporeal membrane oxygenation center. Often, duration of resuscitation, low flow state, presenting pH, and circumstances of arrest dictate candidacy for extracorporeal membrane oxygenation. We present a case of extremely prolonged resuscitation for out-of-hospital arrest in a pediatric patient, and we describe the use of mechanical compression device and transition to extracorporeal membrane oxygenation. We present the case outcome as well as brief discussion about controversies in extracorporeal cardiopulmonary

resuscitation. We hope the case provides an opportunity for further discussion regarding opportunities to improve selection, use of extracorporeal cardiopulmonary resuscitation, and impact outcomes.

PEDIATRIA

Trends in Survival after Pediatric In-Hospital Cardiac Arrest in the United States.

Holmberg MJ(1), Wiberg S(2), Ross CE(3), Kleinman M(4), Hoeyer-Nielsen AK(5), Donnino MW(6), Andersen LW(1); American Heart Association's Get With The Guidelines®-Resuscitation Investigators.

Abstract

BACKGROUND: Cardiac arrest in hospitalized children is associated with poor outcomes, but no contemporary study has reported whether trends in survival have changed over time. In this study, we examined temporal trends in survival for pediatric patients with an in-hospital pulseless cardiac arrest and pediatric patients with a non-pulseless cardiopulmonary resuscitation event from 2000 to 2018. METHODS: This was an observational study of hospitalized pediatric patients (≤18 years of age) who received cardiopulmonary resuscitation from January 2000 to December 2018 and were included in the Get With The Guidelines®-Resuscitation registry, a US-based in-hospital cardiac arrest registry. The primary outcome was survival to hospital discharge and the secondary outcome was return of spontaneous circulation (binary outcomes). Generalized estimation equations were used to obtain unadjusted trends in outcomes over time. Separate analyses were performed for patients with a pulseless cardiac arrest and patients with a non-pulseless event (bradycardia with poor perfusion) requiring cardiopulmonary resuscitation. A subgroup analysis was conducted for shockable vs non-shockable initial rhythms in pulseless events. RESULTS: A total of 7433 patients with a pulseless cardiac arrest and 5751 patients with a non-pulseless event were included for the analyses. For pulseless cardiac arrests, survival was 19% (95%CI, 11%-29%) in 2000 and 38% (95%CI, 34%-43%) in 2018, with an absolute change of 0.67% (95%CI, 0.40%-0.95%; p <0.001) per year, although the increase in survival appeared to stagnate following 2010. Return of spontaneous circulation also increased over time, with an absolute change of 0.83% (95%CI, 0.53%-1.14%; p <0.001) per year. We found no interaction between survival to hospital discharge and the initial rhythm. For non-pulseless events, survival was 57% (95%CI, 39%-75%) in 2000 and 66% (95%CI, 61%-72%) in 2018, with an absolute change of 0.80% (95%CI, 0.32%-1.27%; p = 0.001) per year. CONCLUSIONS: Survival has improved for pediatric events requiring cardiopulmonary resuscitation in the US, with a 19% absolute increase in survival for in-hospital pulseless cardiac arrests and a 9% absolute increase in survival for non-pulseless events between 2000 and 2018. However, survival from pulseless cardiac arrests appeared to have reached a plateau following 2010.

RECERCA EXPERIMENTAL

Alterations in Respiratory Mechanics and Neural Respiratory Drive After Restoration of Spontaneous Circulation in a Porcine Model Subjected to Different Downtimes of Cardiac Arrest.

Yang Z(1), Zheng H(1)(2), Lin L(1), Hou J(1), Wen C(1), Wang Y(1), Ling Q(1), Jiang L(1), Tang W(1)(3), Chen R(1).

Abstract

BACKGROUND The potential alterations of respiratory pathophysiology after cardiopulmonary resuscitation (CPR) are relatively undefined. While untreated arrest is known to affect post-cardiopulmonary resuscitation circulation, whether it affects respiratory pathophysiology remains unclear. We aimed to investigate the post-

cardiopulmonary resuscitation changes in respiratory mechanics and neural respiratory drive with varying delays (5 or 10 minutes) in the treatment of ventricular fibrillation (VF). METHODS AND RESULTS Twenty-six male Yorkshire pigs were used. Anesthetized pigs weighing 38±5 kg were randomized into 3 groups (n=10 each in the VF5 and VF10 groups, with VF kept untreated for 5 and 10 minutes, respectively, and n=6 in the sham group without VF). Defibrillation was attempted after 6 minutes of cardiopulmonary resuscitation. Pulse-induced contour cardiac output, respiratory mechanics, diaphragmatic electromyogram, blood gas, lung imaging, and histopathology were evaluated for 12 hours. Significantly elevated mean root mean square of diaphragmatic electromyogram, transdiaphragmatic pressure, and minute ventilation were observed, but reduced minute ventilation/mean root mean square, dynamic pulmonary compliance, and Pao_2 were noted in both VF groups. Despite recovery of spontaneous breathing, the abnormalities in respiratory mechanics and neural respiratory drive, Pao_2, and extravascular lung water continued to last for >12 hours. The changes in imaging (P=0.027) and histopathology (P=0.012) were more severe in the VF10 group compared with the VF5 group. CONCLUSIONS There is an uncoupling between the respiratory center and ventilation after restoration of spontaneous circulation. Prolonged untreated arrest from cardiac arrest contributes to more serious alterations in lung pathophysiology.

FREE FULL TEXT

α7 Nicotinic Acetylcholine Receptor Mediates the Neuroprotection of Remote Ischemic Postconditioning in a Rat Model of Asphyxial Cardiac Arrest.

Han R(1), Zhang G(2), Qiao X(3), Guo Y(1), Sun L(1), Li J(1), Gao C(4), Sun X(5).

Abstract

BACKGROUND: Remote ischemic postconditioning (RIPost) has been shown to reduce the ischemia-reperfusion injury of the heart and brain. However, the protection mechanisms have not yet been fully elucidated. We have observed that RIPost could alleviate the brain injury after cardiac arrest (CA). The aim of this study was to explore whether α7 nicotinic acetylcholine receptor (α7nAChR) mediates the neuroprotection of RIPost in a rat model of asphyxial CA. MATERIALS AND METHODS: Asphyxial CA model was induced by occlusion of the tracheal tube for 8 min and resuscitated later. RIPost produced by three cycles of 15-min occlusion and 15-min release of the right hind limb by a tourniquet was performed respectively at the moment and the third hour after restoration of spontaneous circulation. The α7nAChR agonist PHA-543613 and the antagonist methyllycaconitine (MLA) were used to investigate the role of α7nAChR in mediating neuroprotective effects. RESULTS: Results showed that α7nAChR was decreased in hippocampus and cortex after resuscitation, whereas RIPost could attenuate the reduction. The use of PHA-543613 provided neuroprotective effects against cerebral injury after CA. Furthermore, RIPost decreased the levels of neuron-specific enolase, inflammatory mediators, the number of apoptotic cells, and phosphorylation of nuclear factor-κB while increased the phosphorylation of signal transducer and activator of transcription-3. However, the above effects of RIPost were attenuated by α7nAChR antagonist methyllycaconitine. CONCLUSIONS: Neuroprotection of RIPost was related with the activation of α7nAChR, which could suppress nuclear factor-κB and activate signal transducer and activator of transcription-3 in a rat asphyxial CA model.

PD98059 protects the brain against mitochondrial-mediated apoptosis and autophagy in a cardiac arrest rat model.

Zheng JH(1), Xie L(2), Li N(1), Fu ZY(1), Tan XF(1), Tao R(1), Qin T(1), Chen MH(3).

Abstract

AIMS: Mitochondrial dysfunction has been regarded as one of the hallmarks of cerebral ischemia-reperfusion injury. In previous studies, we have provided evidence that the extracellular signaling pathway (ERK) 1/2 inhibitor PD98059 improved the neurological deficits by modulating antioxidant and anti-apoptotic activities in rats

subjected to cardiac arrest/cardiopulmonary resuscitation (CA/CPR). Since oxidative stress can activate mitochondria-dependent apoptosis and autophagy, we further explored the effects of PD98059 on mitochondria involved with apoptosis and autophagy in rat CA model. MATERIALS AND METHODS: We disposed PD98059 in CA/CPR rats, tested the mitochondrial-mediated apoptosis pathway in brain tissues at 24 h post-resuscitation by mitochondrial permeability transition pores (MPTP), cytochrome c (CytC), BCL-2, BAX, caspase-3, as well as autophagy by LC3, Beclin-1, and p62. Furthermore, we explored the relationship of dynamin-related protein 1 (Drp1) with apoptosis and autophagy. KEY FINDINGS: Our study showed that PD98059 decreased the openings of MPTP, CytC release, caspase3 activation, apoptotic indices, LC3-II, Beclin-1and increased P62. PD98059 also inhibited mitochondria-dependent apoptosis and the activity of autophagy in a dose-dependent manner in rat cerebral cortices at 24 h post-resuscitation. The generation of phosphorylated Drp1-616 was down-regulated accompanied by a decrease of TUNEL-positive cells and LC3 in dual immunostaining after PD98059 inhibited activation of ERK signaling pathway in a dose-dependent manner in rat cerebral cortices at 24 h post-resuscitation. SIGNIFICANCE: PD98059 protects the brain against mitochondrial-mediated apoptosis and autophagy at 24 h post-resuscitation in rats subjected to CA/CPR, which is linked with the downregulation of Drp1 expression.

Inhalation of high-concentration hydrogen gas attenuates cognitive deficits in a rat model of asphyxia induced-cardiac arrest.

Huang L(1), Applegate Ii RL(2), Applegate PM(3), Gong L(4), Ocak U(5), Boling W(1), Zhang JH(6).

Abstract

Cognitive deficits are a devastating neurological outcome seen in survivors of cardiac arrest. We previously reported water electrolysis derived 67% hydrogen gas inhalation has some beneficial effects on short-term outcomes in a rat model of global brain hypoxia-ischemia induced by asphyxia cardiac arrest. In the present study, we further investigated its protective effects in long-term spatial learning memory function using the same animal model. Water electrolysis derived 67% hydrogen gas was either administered 1 hour prior to cardiac arrest for 1 hour and at 1-hour post-resuscitation for 1 hour (pre- & post-treatment) or at 1-hour post-resuscitation for 2 hours (post-treatment). T-maze and Morris water maze were used for hippocampal memory function evaluation at 7 and 14 days post-resuscitation, respectively. Neuronal degeneration within hippocampal Cornu Ammonis 1 (CA1) regions was examined by Fluoro-Jade staining ex vivo. Hippocampal deficits were detected at 7 and 18 days post-resuscitation, with increased neuronal degeneration within hippocampal CA1 regions. Both hydrogen gas treatment regimens significantly improved spatial learning function and attenuated neuronal degeneration within hippocampal CA1 regions at 18 days post-resuscitation. Our findings suggest that water electrolysis derived 67% hydrogen gas may be an effective therapeutic approach for improving cognitive outcomes associated with global brain hypoxia-ischemia following cardiac arrest. The study was approved by the Animal Health and Safety Committees of Loma Linda University, USA (approval number: IACUC #8170006) on March 2, 2017.

Bone marrow-derived mesenchymal stem cell transplantation attenuates overexpression of inflammatory mediators in rat brain after cardiopulmonary resuscitation.

Lin QM(1), Tang XH(1), Lin SR(1), Chen BD(1), Chen F(1).

Abstract

Emerging evidence suggests that bone marrow-derived mesenchymal stem cell transplantation improves neurological function after cardiac arrest and cardiopulmonary resuscitation; however, the precise mechanisms remain unclear. This study aimed to investigate the effect of bone marrow-derived mesenchymal stem cell treatment on expression profiles of multiple cytokines in the brain after cardiac arrest and cardiopulmonary resuscitation. Cardiac arrest was induced in rats by asphyxia and cardiopulmonary resuscitation was initiated 6 minutes after cardiac arrest. One hour after successful cardiopulmonary resuscitation, rats were injected with either phosphate-buffered saline (control) or 1×10^6 bone marrow-derived mesenchymal stem cells via the tail

vein. Serum S100B levels were measured by enzyme-linked immunosorbent assay and neurological deficit scores were evaluated to assess brain damage at 3 days after cardiopulmonary resuscitation. Serum S100B levels were remarkably decreased and neurological deficit scores were obviously improved in the mesenchymal stem cell group compared with the phosphate-buffered saline group. Brains were isolated from the rats and expression levels of 90 proteins were determined using a RayBio Rat Antibody Array, to investigate the cytokine profiles. Brain levels of the inflammatory mediators tumor necrosis factor-α, interferon-γ, macrophage inflammatory protein-1α, macrophage inflammatory protein-2, macrophage inflammatory protein-3α, macrophage-derived chemokine, and matrix metalloproteinase-2 were decreased ≥ 1.5-fold, while levels of the anti-inflammatory factor interleukin-10 were increased ≥ 1.5-fold in the mesenchymal stem cell group compared with the control group. Donor mesenchymal stem cells were detected by immunofluorescence to determine their distribution in the damaged brain and were primarily observed in the cerebral cortex. These results indicate that bone marrow-derived mesenchymal stem cell transplantation attenuates brain damage induced by cardiac arrest and cardiopulmonary resuscitation, possibly via regulation of inflammatory mediators. This experimental protocol was approved by the Institutional Animal Care and Use Committee of Fujian Medical University, China in January 2016 (approval No. 2016079).

CASE REPORTS

Transection and Relocation of Anomalous Left Coronary Artery After Aborted Sudden Cardiac Death.

Al Kindi HN(1), Yacoub MH(2).

Abstract

Anomalous origin of the left main coronary artery from the right coronary sinus is associated with sudden cardiac death. We present a young adult who was diagnosed with this anomaly after an aborted sudden cardiac death. He underwent a complete anatomical repair by translocating the left coronary artery to the left coronary sinus of Valsalva, with excellent 10 years outcome.

Survival after pre-hospital emergency clamshell thoracotomy for blunt cardiac rupture.

Rogerson T(1), Efstratiades T(2), Von Oppell U(2), Davies G(3), Curtin R(4).

Abstract

Blunt trauma causing cardiac rupture is usually fatal. We report a patient with blunt cardiac injury that suffered traumatic cardiac arrest in the pre-hospital phase of their care. A cardiac tamponade was confirmed with portable ultrasound in a brief return of circulation. The patient had a further cardiac arrest and subsequently underwent damage control emergency surgery via a clamshell thoracotomy at the scene. The tamponade was released and a clamp was applied to the identified left atrial appendage rupture, a return of circulation then occurred. He was transferred to a cardiothoracic centre where a left atrial appendage rupture was identified and closed. The patient had a complicated recovery in hospital but went on to survive neurologically intact. This is the first documented case report of a neurologically intact survivor of a pre-hospital clamshell thoracotomy for blunt trauma. Although survivors of blunt trauma who have pre-hospital thoracotomy are extremely rare it should be considered in very specific circumstances.