

RCP / COMPRESSORS TORÀCICS MECÀNICS

Sense articles aquesta setmana

REGISTRES, REVISIONS I EDITORIALS

1. Anesthesiology. 2019 Apr 17. doi: 10.1097/ALN.0000000000002700. [Epub ahead of print]

Postresuscitation Care after Out-of-hospital Cardiac Arrest: Clinical Update and Focus on Targeted Temperature Management.

Kirkegaard H(1), Taccone FS, Skrifvars M, Søreide E.

Abstract

Out-of-hospital cardiac arrest is a major cause of mortality and morbidity worldwide. With the introduction of targeted temperature management more than a decade ago, postresuscitation care has attracted increased attention. In the present review, we discuss best practice hospital management of unconscious out-of-hospital cardiac arrest patients with a special focus on targeted temperature management. What is termed post-cardiac arrest syndrome strikes all organs and mandates access to specialized intensive care. All patients need a secured airway, and most patients need hemodynamic support with fluids and/or vasopressors. Furthermore, immediate coronary angiography and percutaneous coronary intervention, when indicated, has become an essential part of the postresuscitation treatment. Targeted temperature management with controlled sedation and mechanical ventilation is the most important neuroprotective strategy to take. Targeted temperature management should be initiated as quickly as possible, and according to international guidelines, it should be maintained at 32° to 36°C for at least 24 h, whereas rewarming should not increase more than 0.5°C per hour. However, uncertainty remains regarding targeted temperature management components, warranting further research into the optimal cooling rate, target temperature, duration of cooling, and the rewarming rate. Moreover, targeted temperature management is linked to some adverse effects. The risk of infection and bleeding is moderately increased, as is the risk of hypokalemia and magnesemia. Circulation needs to be monitored invasively and any deviations corrected in a timely fashion. Outcome prediction in the individual patient is challenging, and a self-fulfilling prophecy poses a real threat to early prognostication based on clinical assessment alone. Therefore, delayed and multimodal prognostication is now considered a key element of postresuscitation care. Finally, modern postresuscitation care can produce good outcomes in the majority of patients but requires major diagnostic and therapeutic resources and specific training. Hence, recent international guidelines strongly recommend the implementation of regional prehospital resuscitation systems with integrated and specialized cardiac arrest centers.

2. Curr Opin Crit Care. 2019 Jun;25(3):199-203. doi: 10.1097/MCC.0000000000000614.

Prehospital termination of resuscitation rule.

Morrison LJ(1).

Abstract

PURPOSE OF REVIEW: The purpose of the review is to briefly describe the derivation, validation and implementation of the Termination of Resuscitation Rules for out-of-hospital adult cardiac arrest and to

describe the controversies surrounding implementation that have been recently published. RECENT FINDINGS: New guidelines, new interventions that alter baseline survival, the use of eCPR and issues related to duration of CPR have minimal impact on the sustainability and application of the TOR rule. Some published articles related to using only one criterion in the rule may be cavalier and miss potential survivors. Decisions based on discretion may cause wide variation in termination rates and evidence-based decision rules are in the best interest of distributive justice for the patient and comfort for the provider. SUMMARY: The Universal Termination of Resuscitation Rule has a built-in sensibility to the introduction of new treatment guidelines, including emphasis on CPR metrics, changes in baseline survival rates, duration of resuscitation and new treatment options including eCPR and postarrest care. As well, the TOR rule continues to address inconsistencies in practice and improve provider comfort.

3. *Curr Opin Crit Care*. 2019 Jun;25(3):240-243. doi: 10.1097/MCC.0000000000000609.

Out-of-hospital cardiac arrest survivors need both cardiological and neurological rehabilitation!

Boyce LW(1)(2), Goossens PH(3), Moulaert VR(4), Pound G(5), van Heugten CM(6)(7)(8).

Abstract

PURPOSE OF REVIEW: Most survivors of out-of-hospital cardiac arrest (OHCA) suffer from cardiologic symptoms and approximately half of them experience cognitive problems because of hypoxic brain damage. Symptoms of anxiety and depression are also common. This review aims to give an overview of recent literature on rehabilitation treatment aiming at improvement of quality of life after OHCA. RECENT FINDINGS: Existing cognitive screening tools are now validated for OHCA survivors. OHCA patients with cognitive deficits may have lower exercise capacity. Cardiac rehabilitation seems to be well tolerated for OHCA survivors, with outcomes comparable to myocardial infarction patients. Many caregivers suffer from posttraumatic stress disorder and emotional stress. Interventions for them are available. Implementation of integrated programs covering both cognitive and cardiac rehabilitation is hampered by lack of knowledge and organizational barriers. SUMMARY: OHCA survivors should be routinely screened for cognitive and emotional problems. When patients with mild cognitive deficits participate in cardiac rehabilitation, their program should be adjusted to their cognitive abilities. For patients with severe cognitive or emotional problems, individualized rehabilitation seems favorable. Integrated rehabilitation treatment between cardiac and cognitive rehabilitation departments is recommended. Attention should be paid to the burden of caregivers.

4. *Curr Opin Crit Care*. 2019 Jun;25(3):234-239. doi: 10.1097/MCC.0000000000000607.

Assessment of neurocognitive function after cardiac arrest.

Blennow Nordström E(1), Lilja G.

Abstract

PURPOSE OF REVIEW: Impaired neurocognitive function is common in cardiac arrest survivors and the use of specific neurocognitive assessments are recommended in both clinical trials and daily practice. This review examines the most recent evidence to guide in the selection of neurocognitive outcome assessment tools after cardiac arrest. RECENT FINDINGS: Neurocognitive impairment after cardiac arrest was recently reported as one of the major predictors for societal participation, highlighting the need for neurocognitive assessments. A subjective report is a simple method to screen for cognitive problems, but divergent findings were reported when comparing with objective measures. A standardized observer report may be useful for cognitive screening postcardiac arrest. The Montreal Cognitive Assessment (MoCA) was recommended for cognitive screening after cardiac arrest. Detailed neurocognitive assessments were reported as valuable for in-depth evaluation of patients in interventional studies. The

best time-point for neurocognitive assessments remains unknown. Recent findings report that most neurocognitive recovery is seen within the first months after cardiac arrest, with some improvement also noted between 3 and 12 months postcardiac arrest. SUMMARY: Neurocognitive assessments after cardiac arrest are important and the approach should differ depending on the clinical situation. Large, prospective, well designed studies, to guide the selection of neurocognitive assessments after cardiac arrest, are urgently needed.

5. Curr Opin Crit Care. 2019 Jun;25(3):211-217. doi: 10.1097/MCC.0000000000000611.

Assessing brain injury after cardiac arrest, towards a quantitative approach.

Cronberg T(1).

Abstract

PURPOSE OF REVIEW: Withdrawal of life-sustaining therapy due to a presumed poor neurological prognosis precedes most deaths in patients who have been resuscitated after an out-of-hospital cardiac arrest and are being treated in an ICU. Guidelines to support these critical decisions recommend a multimodal strategy based on advanced diagnostic methods. This review will discuss clinical experience with the 2015 guidelines and recent developments towards more accurate quantification of posthypoxic brain injury. RECENT FINDINGS: Qualitative assessment of clinical findings, neurophysiological signals and radiological images are prone to error due to the individual assessors' experience and competence. Currently, the only quantitative method for assessment of postarrest brain injury in regular clinical use is the measurement of neuron-specific enolase in serum. Since 2015 several promising methods to standardize assessment have been introduced including pupillometry, standardized electroencephalography interpretation and the quantification of somatosensory evoked potentials, computed tomography and MRI-signals. In addition, novel and superior blood biomarkers are on the verge of clinical introduction. SUMMARY: The current guidelines for neuroprognostication include a step-by-step multimodal algorithm but many patients will still be left with an uncertain prognosis 4-5 days after cardiac arrest. Novel quantitative methods are a necessary step to a more nuanced prediction of outcome for this group of patients.

6. Curr Opin Crit Care. 2019 Jun;25(3):204-210. doi: 10.1097/MCC.0000000000000613.

Cardiac arrest: prediction models in the early phase of hospitalization.

Dumas F(1)(2), Bougouin W(2)(3), Cariou A(2)(4).

Abstract

PURPOSE OF REVIEW: There is a need for an early assessment of outcome in patients with return of spontaneous circulation after cardiac arrest. During the last decade, several models were developed in order to identify predictive factors that may facilitate prognostication and stratification of outcome. RECENT FINDINGS: In addition to prognostication tools that are used in intensive care, at least five scores were recently developed using large datasets, based on simple and immediately available parameters, such as circumstances of arrest and early in-hospital indicators. Regarding neurological outcome, predictive performance of these models is good and even excellent for some of them. These scores perform very well for identifying patients at high-risk of unfavorable outcome. The most important limitation of these scores remains the lack of replication in different communities. In addition, these scores were not developed for individual decision-making, but they could instead be useful for the description and comparison of different cohorts, and also to design trials targeting specific categories of patients regarding outcome. Finally, the recent development of big data allows extension of research in epidemiology of cardiac arrest, including the identification of new prognostic factors and the

improvement of prediction according to the profile of populations. SUMMARY: In addition to the development of artificial intelligence, the prediction approach based on adequate scores will further increase the knowledge in prognostication after cardiac arrest. This strategy may help to develop treatment strategies according to the predicted severity of the outcome.

7. *Curr Opin Crit Care*. 2018 Jun;24(3):151-157. doi: 10.1097/MCC.0000000000000505.

In-hospital cardiac arrest: are we overlooking a key distinction?

Moskowitz A(1), Holmberg MJ(2)(3), Donnino MW(1)(2), Berg KM(1).

Abstract

PURPOSE OF REVIEW: To review the epidemiology, peri-arrest management, and research priorities related to in-hospital cardiac arrest (IHCA) and explore key distinctions between IHCA and out-of-hospital cardiac arrest (OHCA) as they pertain to the clinician and resuscitation scientist. **RECENT FINDINGS:** IHCA is a common and highly morbid event amongst hospitalized patients in the United States. As compared with patients who experience an OHCA, patients who experience an IHCA tend to have more medical comorbidities, have a witnessed arrest, and be attended to by professional first responders. Further, providers resuscitating patients from IHCA commonly have access to tools and information not readily available to the OHCA responders. Despite these differences, society guidelines for the peri-arrest management of patients with IHCA are often based on data extrapolated from the OHCA population. To advance the care of patients with IHCA, clinicians and investigators should recognize the many important distinctions between OHCA and IHCA. **SUMMARY:** IHCA is a unique disease entity with an epidemiology and natural history that are distinct from OHCA. In both research and clinical practice, physicians should recognize these distinctions so as to advance the care of IHCA victims.

8. *Curr Opin Crit Care*. 2018 Jun;24(3):143-150. doi: 10.1097/MCC.0000000000000499.

Physiology-directed cardiopulmonary resuscitation: advances in precision monitoring during cardiac arrest.

Marquez AM(1), Morgan RW(1), Ross CE(2), Berg RA(1), Sutton RM(1).

Abstract

PURPOSE OF REVIEW: We review the recent advances in physiologic monitoring during cardiac arrest and offer an evidence-based framework for prioritizing physiologic targets during cardiopulmonary resuscitation (CPR). **RECENT FINDINGS:** Current CPR guidelines recommend a uniform approach for all patients in cardiac arrest, but newer data support a precision strategy that uses the individual patient's physiology to guide resuscitation. Coronary perfusion pressure and arterial DBP are associated with survival outcomes in recent animal and human studies. End-tidal carbon dioxide is a reasonable noninvasive alternative, but may be inferior to invasive hemodynamic endpoints. Cerebral oximetry and cardiac ultrasound are emerging physiologic indicators of CPR effectiveness. **SUMMARY:** Physiologic monitoring can and should be used to deliver precision CPR whenever possible and may improve outcomes after cardiac arrest.

9. *Curr Opin Crit Care*. 2018 Jun;24(3):138-142. doi: 10.1097/MCC.0000000000000498.

Antiarrhythmic drug therapy during cardiopulmonary resuscitation: should we use it?

Soar J(1).

Abstract

PURPOSE OF REVIEW: The optimal antiarrhythmic drug therapy (amiodarone or lidocaine) in the treatment of ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT) cardiac arrest that is refractory to defibrillation is uncertain. This article reviews the evidence for and against these drugs, alternatives treatments for refractory VF/pVT and aims to define the role of antiarrhythmic drugs during cardiopulmonary resuscitation (CPR). **RECENT FINDINGS:** A large randomized controlled trial that compared amiodarone, lidocaine and saline 0.9% sodium chloride for the treatment of refractory VF/pVT out-of-hospital cardiac arrest reported no difference in survival to hospital discharge or neurological outcome. In patients with witnessed arrest, survival was improved with antiarrhythmic drugs compared to saline. **SUMMARY:** The benefit of antiarrhythmic drugs appears to be for those patients in whom initial early CPR and defibrillation attempts fail and the antiarrhythmic drug is given early. There does not appear to be any clear survival benefit for any one particular drug and other factors such as availability and cost should be considered when deciding which drug to use. Furthermore, other interventions (e.g. percutaneous coronary intervention and extra-corporeal CPR) may provide additional survival benefit when defibrillation attempts, and antiarrhythmic drugs are not effective.

10. *Curr Opin Crit Care*. 2018 Jun;24(3):131-137. doi: 10.1097/MCC.0000000000000497.

To intubate or not to intubate?

Gough CJR(1), Nolan JP(2)(3).

Abstract

PURPOSE OF REVIEW: Cardiac arrest mortality remains high, and the impact on outcome of most advanced life support interventions is unclear. The optimal method for managing the airway during cardiac arrest remains unknown. This review will summarize and critique recently published evidence comparing basic airway management with the use of more advanced airway interventions [insertion of supraglottic airway (SGA) devices and tracheal intubation]. **RECENT FINDINGS:** Systematic reviews generally document an association between advanced airway management and worse neurological outcome but they are subject to considerable bias. A recent observational study of tracheal intubation for in-hospital cardiac arrest that used time-dependent propensity matching showed an association between tracheal intubation during the first 15 min of cardiac arrest and a worse neurological outcome compared with no intubation in the first 15 min. In a recent randomized clinical trial, tracheal intubation was compared with bag-mask ventilation (with intubation only after return of spontaneous circulation) in 2043 patients with out-of-hospital cardiac arrest. There was no difference in favorable neurological outcome at 28 days. **SUMMARY:** Most of the available evidence about airway management during cardiac arrest comes from observational studies. The best option for airway management is likely to be different for different rescuers, and at different time points of the resuscitation process. Thus, it is common for a single patient to receive multiple 'stepwise' airway interventions. The only reliable way to determine the optimal airway management strategy is to undertake properly designed, prospective, randomized trials. One randomized clinical trial has been published recently and two others have completed enrollment but have yet to be published.

11. *Trends Cardiovasc Med*. 2019 Feb;29(2):120-126. doi: 10.1016/j.tcm.2018.07.001. Epub 2018 Jul 10.

Race, ethnicity, and the risk of sudden death<sup/>.

Reinier K(1), Rusinaru C(1), Chugh SS(2).

Abstract

Sudden cardiac death (SCD) is a major cause of death worldwide, with an estimated U.S. annual incidence of 350,000 [1]. This review will examine the influence of race and ethnicity on SCD burden and risk factors, and review the available literature on resuscitation outcomes and primary prevention of SCD. An improved understanding of associations between race, ethnicity, and SCD may provide clues to mechanisms, lead to improved prevention of SCD, and ultimately reduce racial and ethnic disparities in the burden of SCD.

FREE ARTICLE

12. J Clin Med. 2019 Apr 24;8(4). pii: E556. doi: 10.3390/jcm8040556.

Prevention of Sudden Death Related to Sport: The Science of Basic Life Support-from Theory to Practice.

Vancini RL(1), Nikolaidis PT(2), Lira CAB(3), Vancini-Campanharo CR(4), Viana RB(5), Dos Santos Andrade M(6), Rosemann T(7), Knechtle B(8)(9).

Abstract

The sudden cardiac arrest (CA) and death of athletes are dramatic and emotionally impacting events for health professionals, family, and society. Although the practice of sport participation improves general health, physical fitness, and quality of life, intense physical exercise can be a trigger for CA and sudden death occasionally in the presence of known or unknown cardiac disorders (mainly hypertrophic cardiomyopathy) and risk factors (environment, health style, family, and genetic). The present review found that sudden death associated with CA was not such a common event in competitive athletes, but it might be an underestimated event in recreational athletes. Thus, considering the exponential increase in sport participation, both in a recreational or competitive way, and the rate of sudden CA, knowledge of implementing prevention and treatment strategies is crucial. This includes preparation of health professionals and lay people in basic life support (BLS); screening and pre-participation assessment in sport programs and health education; and promotion for the recognition of CA and early completion of BLS and rapid access to automatic external defibrillator to improve the victim survival/prognosis. Thus, the purpose of this review is to provide for health professionals and lay people the most updated information, based on current guidelines, of how to proceed in an emergency situation associated with sudden CA of young adult athletes.

FREE ARTICLE

13. J Emerg Med. 2019 Apr 19. pii: S0736-4679(19)30237-9. doi: 10.1016/j.jemermed.2019.03.030. [Epub ahead of print]

Resuscitative Endovascular Balloon Occlusion of the Aorta: A Review for Emergency Clinicians.

Long B(1), Hafen L(2), Koyfman A(3), Gottlieb M(4).

Abstract

BACKGROUND: Non-compressible torso hemorrhage (NCTH) is difficult to control and associated with significant mortality. Resuscitative endovascular balloon occlusion of the aorta (REBOA) utilizes an infra-diaphragmatic approach to control NCTH and is less invasive than resuscitative thoracotomy (RT). This article highlights the evidence for REBOA and provides an overview of the indications, procedural steps, and complications in adults for emergency clinicians. **DISCUSSION:** Traumatic hemorrhage can be life

threatening. Patients in extremis, whether from NCTH or exsanguination from other sites, may require RT with aortic cross-clamping. REBOA offers another avenue for proximal hemorrhage control and can be completed by emergency clinicians. The American College of Surgeons Committee on Trauma and the American College of Emergency Physicians recently released a joint statement detailing the indications for REBOA in adults. The evidence behind its use remains controversial, with significant heterogeneity among studies. Most studies demonstrate improved blood pressure without a significant improvement in mortality. Procedural steps include arterial access (most commonly the common femoral artery), positioning the initial sheath, balloon preparation and positioning, balloon inflation, securing the balloon/sheath, subsequent hemorrhage control, balloon deflation, and balloon/sheath removal. Several major complications can occur with REBOA placement. Future studies should evaluate training protocols, the role of simulation, and which target populations would benefit most from REBOA. CONCLUSIONS: REBOA can provide proximal hemorrhage control and can be performed by emergency clinicians. This article evaluates the evidence, indications, procedure, and complications for emergency clinicians.

14. Prog Cardiovasc Dis. 2019 Apr 17. pii: S0033-0620(19)30074-X. doi: 10.1016/j.pcad.2019.04.004. [Epub ahead of print]

Can cardiac resynchronization therapy be used as a tool to reduce sudden cardiac arrest risk?

Galand V(1), Singh JP(2), Heist EK(3).

Abstract

Patients with cardiomyopathy and reduced left ventricular (LV) ejection fraction are at risk of heart failure (HF) symptoms and sudden cardiac arrest (SCA). In selected HF patients, cardiac resynchronization therapy (CRT) provides LV reverse remodeling and improves the cellular and molecular function. However controversial results have been published regarding the effect of CRT on the residual ventricular arrhythmia risk. Indeed, the decrease in SCA risk is inconsistent and some factors strongly influence the residual post implantation arrhythmic risk. Conversely, proarrhythmic effect of CRT has been previously described. In this review we aim to describe the relationship between CRT implantation and the SCA risk decrease and discuss the patients who only require cardiac resynchronization therapy-pacemaker and those who need a concomitant implantable cardioverter defibrillator.

ACR INTRAHOSPITALÀRIA

1. PLoS Med. 2018 Nov 30;15(11):e1002709. doi: 10.1371/journal.pmed.1002709. eCollection 2018 Nov.

Characterising risk of in-hospital mortality following cardiac arrest using machine learning: A retrospective international registry study.

Nanayakkara S(1)(2)(3), Fogarty S(4)(5), Tremeer M(5), Ross K(4)(5), Richards B(5)(6), Bergmeir C(7), Xu S(7), Stub D(1)(2)(3), Smith K(8)(9), Tacey M(10), Liew D(10), Pilcher D(10)(11)(12), Kaye DM(1)(2)(3).

Abstract

BACKGROUND: Resuscitated cardiac arrest is associated with high mortality; however, the ability to estimate risk of adverse outcomes using existing illness severity scores is limited. Using in-hospital data available within the first 24 hours of admission, we aimed to develop more accurate models of risk prediction using both logistic regression (LR) and machine learning (ML) techniques, with a combination

of demographic, physiologic, and biochemical information. METHODS AND FINDINGS: Patient-level data were extracted from the Australian and New Zealand Intensive Care Society (ANZICS) Adult Patient Database for patients who had experienced a cardiac arrest within 24 hours prior to admission to an intensive care unit (ICU) during the period January 2006 to December 2016. The primary outcome was in-hospital mortality. The models were trained and tested on a dataset (split 90:10) including age, lowest and highest physiologic variables during the first 24 hours, and key past medical history. LR and 5 ML approaches (gradient boosting machine [GBM], support vector classifier [SVC], random forest [RF], artificial neural network [ANN], and an ensemble) were compared to the APACHE III and Australian and New Zealand Risk of Death (ANZROD) predictions. In all, 39,566 patients from 186 ICUs were analysed. Mean (\pm SD) age was 61 ± 17 years; 65% were male. Overall in-hospital mortality was 45.5%. Models were evaluated in the test set. The APACHE III and ANZROD scores demonstrated good discrimination (area under the receiver operating characteristic curve [AUROC] = 0.80 [95% CI 0.79-0.82] and 0.81 [95% CI 0.8-0.82], respectively) and modest calibration (Brier score 0.19 for both), which was slightly improved by LR (AUROC = 0.82 [95% CI 0.81-0.83], DeLong test, $p < 0.001$). Discrimination was significantly improved using ML models (ensemble and GBM AUROCs = 0.87 [95% CI 0.86-0.88], DeLong test, $p < 0.001$), with an improvement in performance (Brier score reduction of 22%). Explainability models were created to assist in identifying the physiologic features that most contributed to an individual patient's survival. Key limitations include the absence of pre-hospital data and absence of external validation. CONCLUSIONS: ML approaches significantly enhance predictive discrimination for mortality following cardiac arrest compared to existing illness severity scores and LR, without the use of pre-hospital data. The discriminative ability of these ML models requires validation in external cohorts to establish generalisability.

FREE ARTICLE

LESIONS I RCP

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CAUSES DE L'ACR

1. Anatol J Cardiol. 2017 Jul;18(1):54-61. doi: 10.14744/AnatolJCardiol.2017.7593. Epub 2017 May 30.

Assessment of the association between the presence of fragmented QRS and the predicted risk score of sudden cardiac death at 5 years in patients with hypertrophic cardiomyopathy.

Özyılmaz S(1), Akgül Ö, Uyarel H, Pusuroğlu H, Karayakalı M, Gül M, Çetin M, Satılmışoğlu H, Yıldırım A, Bakır İ.

Abstract

OBJECTIVE: It has been shown that the presence of fragmented QRS (fQRS) is associated with poor prognosis in many cardiovascular diseases and in patients with hypertrophic cardiomyopathy (HCM). However, no study has shown an association with the absolute risk score of sudden cardiac death. The aim of this study was to determine the relationship between QRS and the predicted risk score of sudden cardiac death at 5 years (HCM Risk-SCD) in HCM patients. **METHODS:** In total, 115 consecutive HCM

patients were included in this prospective observational study. The patients were divided into two groups according to the presence [fQRS(+) group (n=65)] or absence [fQRS(-) group (n=50)] of fQRS on a 12-lead electrocardiogram (ECG). RESULTS: The HCM Risk-SCD (%) HCM Risk-SCD (>6%) values and some echocardiographic parameters, including ventricular extrasystole, ventricular tachycardia, cardiopulmonary resuscitation, implantable cardioverter defibrillator implantation, appropriate shock, and heart failure at the time of admission, were significantly higher in the fQRS(+) group than in the fQRS(-) group (all $p<0.05$). Both univariate and multivariate analyses revealed fQRS and New York Heart Association (NYHA) class as independent predictors of HCM Risk-SCD. In a receiver operating characteristic (ROC) curve analysis, an HCM Risk-SCD value of >4 was identified as an effective cut-off point in fQRS for HCM. An HCM Risk-SCD value of >4 yielded a sensitivity of 77% and a specificity of 76%. CONCLUSION: fQRS is determined to be an independent high-risk indicator of HCM Risk-SCD. It seems to be associated with increased ventricular arrhythmias and some echocardiographic parameters.

FREE ARTICLE

END-TIDAL CO₂

1. Resuscitation. 2019 Apr 18. pii: S0300-9572(19)30132-7. doi: 10.1016/j.resuscitation.2019.03.048. [Epub ahead of print]

Capnography: A support tool for the detection of return of spontaneous circulation in out-of-hospital cardiac arrest.

Elola A(1), Aramendi E(2), Irusta U(2), Alonso E(2), Lu Y(3), Chang MP(4), Owens P(4), Idris AH(4).

Abstract

BACKGROUND: Automated detection of return of spontaneous circulation (ROSC) is still an unsolved problem during cardiac arrest. Current guidelines recommend the use of capnography, but most automatic methods are based on the analysis of the ECG and thoracic impedance (TI) signals. This study analysed the added value of EtCO₂ for discriminating pulsed (PR) and pulseless (PEA) rhythms and its potential to detect ROSC. **MATERIALS AND METHODS:** A total of 426 out-of-hospital cardiac arrest cases, 117 with ROSC and 309 without ROSC, were analysed. First, EtCO₂ values were compared for ROSC and no ROSC cases. Second, 5098 artefact free 3-s long segments were automatically extracted and labelled as PR (3639) or PEA (1459) using the instant of ROSC annotated by the clinician on scene as gold standard. Machine learning classifiers were designed using features obtained from the ECG, TI and the EtCO₂ value. Third, the cases were retrospectively analysed using the classifier to discriminate cases with and without ROSC. **RESULTS:** EtCO₂ values increased significantly from 41mmHg 3-min before ROSC to 57mmHg 1-min after ROSC, and EtCO₂ was significantly larger for PR than for PEA, 46mmHg/20mmHg ($p<0.05$). Adding EtCO₂ to the machine learning models increased their area under the curve (AUC) by over 2 percentage points. The combination of ECG, TI and EtCO₂ had an AUC for the detection of pulse of 0.92. Finally, the retrospective analysis showed a sensitivity and specificity of 96.6% and 94.5% for the detection of ROSC and no-ROSC cases, respectively. **CONCLUSION:** Adding EtCO₂ improves the performance of automatic algorithms for pulse detection based on ECG and TI. These algorithms can be used to identify pulse on site, and to retrospectively identify cases with ROSC.

2. Resuscitation. 2019 Apr 18. pii: S0300-9572(19)30129-7. doi: 10.1016/j.resuscitation.2019.04.015. [Epub ahead of print]

Usefulness of cerebral rSO₂ monitoring during CPR to predict the probability of return of spontaneous circulation.

Takegawa R(1), Shiozaki T(2), Ogawa Y(2), Hirose T(2), Mori N(2), Ohnishi M(2), Ishihara T(3), Shintani A(3), Shimazu T(2).

Abstract

BACKGROUND: Cerebral oximetry (rSO₂) may be useful in assessing the probability of return of spontaneous circulation (ROSC). However, the potential of assessing the trend in the rSO₂ value has not been discussed when determining the probability of ROSC. **METHODS:** This was a retrospective study of out-of-hospital cardiac arrest (OHCA) patients with continuous rSO₂ values recorded during cardiopulmonary arrest. We used logistic regression analysis at each time point to investigate the best subsets of rSO₂-related variables for ROSC, which included rSO₂ (baseline), the baseline value of rSO₂; amount of maximum rise, the maximum difference of rSO₂ from rSO₂ (baseline) over t minutes; $\Delta rSO_2(t)$:(amount of maximum rise)/rSO₂ (baseline) over t minutes after hospital arrival. **RESULTS:** Among the 90 included patients, 35 achieved ROSC. Area under the curve (AUC) analysis revealed that ΔrSO_2 over a 16-min measurement period was significantly higher than ΔrSO_2 measured over 4-, 8-, 12-, and 20-min periods. During this 16-min period, the subset showing the best AUC value was interaction of the amount of maximum rise and rSO₂ (baseline) rather than the amount of maximum rise or ΔrSO_2 alone (AUC = 0.91). **CONCLUSIONS:** The combination of rSO₂ (baseline) with the amount of maximum rise in rSO₂ value over time might be a new index for the prediction of ROSC that could be useful in guiding cardiopulmonary resuscitation. Further studies are needed to validate these findings.

DONACIÓ D'ÒRGANS

Sense articles

FEEDBACK

1. Am J Emerg Med. 2019 Apr 12. pii: S0735-6757(19)30245-1. doi: 10.1016/j.ajem.2019.04.025. [Epub ahead of print]

Quality retention of chest compression after repetitive practices with or without feedback devices: A randomized manikin study.

Zhou XL(1), Wang J(2), Jin XQ(3), Zhao Y(4), Liu RL(1), Jiang C(1).

Abstract

OBJECTIVES: This study was designed to investigate whether an audiovisual feedback (AVF) device is beneficial for quality retention of chest compression (CC) after repetitive practices (RP). **METHODS:** After completion of a 45-min CC-only cardiopulmonary resuscitation (CPR) training, participants performed 3 sessions of practices on days 1, 3, and 7 under the guidance of an instructor with (RP + AVF) or without (RP) the AVF device. CC quality was determined after each session and was retested at 3 and 12 months. **RESULTS:** In total, ninety-seven third year university students participated in this study. CC quality was improved after 3 sessions in both the RP and RP + AVF groups. Retests at 3 months showed that the proportions of appropriate CC rate and correct hand position were significantly decreased in the RP group

as compared with the last practice ($p < 0.05$). However, no significant changes in CC quality were observed in the RP + AVF group. However, the proportions of appropriate CC rate, depth, and complete recoil were significantly decreased after 12 months in both RP and RP + AVF groups ($p < 0.05$). There were no significant differences in these parameters between the RP and the RP + AVF groups at 12 months after RP. **CONCLUSION:** With RP, the use of an AVF device further improves initial CC skill acquisition and short-term quality retention. However, long-term quality retention is not statistically different between rescuers who receive verbal human feedback only and those who receive additional AVF device feedback after RP.

FÀRMACS

Sense articles

TRAUMA

1. Emerg Med J. 2019 Apr 19. pii: emermed-2018-208165. doi: 10.1136/emmermed-2018-208165. [Epub ahead of print]

Prehospital determinants of successful resuscitation after traumatic and non-traumatic out-of-hospital cardiac arrest.

Barnard B(1)(2), Sandbach DD(1), Nicholls TL(3), Wilson AW(1), Ercole A(1)(4).

Abstract

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) is prevalent in the UK. Reported survival is lower than in countries with comparable healthcare systems; a better understanding of outcome determinants may identify areas for improvement. **METHODS:** An analysis of 9109 OHCA attended in East of England between 1 January 2015 and 31 July 2017. Univariate descriptives and multivariable analysis were used to understand the determinants of survival for non-traumatic cardiac arrest (NTCA) and traumatic cardiac arrest (TCA). Two Utstein outcome variables were used: survival to hospital admission and hospital discharge. **RESULTS:** The incidence of OHCA was 55.1 per 100 000 population/year. The overall survival to hospital admission was 27.6% (95% CI 26.7% to 28.6%) and the overall survival to discharge was 7.9% (95% CI 7.3% to 8.5%). Survival to hospital admission and survival to hospital discharge were both greater in the NTCA group compared with the TCA group: 27.9% vs 19.3% $p=0.001$, and 8.0% vs 3.8% $p=0.012$ respectively. Determinants of NTCA and TCA survival were different, and varied according to the outcome examined. In NTCA, bystander cardiopulmonary resuscitation (CPR) was associated with survival at discharge but not at admission, and the likelihood of bystander CPR was dependent on geographical socioeconomic status. An air ambulance was associated with increased survival to both hospital admission and discharge in NTCA, but only with survival to admission in TCA. **CONCLUSION:** NTCA and TCA are clinically distinct entities with different predictors for outcome-future OHCA reports should aim to separate arrest aetiologies. Determinants of survival to hospital admission and discharge differ in a way that likely reflects the determinants of neurological injury. Bystander CPR public engagement may be best focused in more deprived areas.

FREE ARTICLE

VENTILACIÓ

1. Resuscitation. 2019 Apr 19. pii: S0300-9572(19)30140-6. doi: 10.1016/j.resuscitation.2019.04.023. [Epub ahead of print]

The EXACT protocol: A multi-centre, single-blind, randomised, parallel-group, controlled trial to determine whether early oxygen titration improves survival to hospital discharge in adult OHCA patients.

Bray JE(1), Smith K(1), Hein C(1), Finn J(1), Stephenson M(1), Cameron P(1), Stub D(1), Perkins GD(1), Grantham H(1), Bailey P(1), Brink D(1), Dodge N(1), Bernard S(1); EXACT investigators.

Abstract

BACKGROUND: Experimental and observational research suggests hyperoxia following resuscitation from cardiac arrest is associated with neurological injury and worse clinical outcomes. This paper describes the rationale and design of the EXACT trial. EXACT aims to determine whether reducing oxygen in the acute phase of post-resuscitation care for out-of-hospital cardiac arrest (OHCA) improves survival. **METHODS:** EXACT is a multi-centre, randomised (1:1), single-blind, parallel trial. Presumed cardiac OHCA cases who achieve a return of spontaneous circulation will be eligible if they are comatose, with an advanced airway and have an oxygen saturation (SpO₂) ≥95% on >10 L/min (or 100% oxygen). Paramedics will randomise 1286 eligible cases to receive oxygen therapy targeting an SpO₂ of 90-94% (intervention) or 98-100% (control). Study treatment will continue until admission to an intensive care unit or hospital ward. The primary outcome is survival to hospital discharge. Secondary outcomes include 12-month survival and quality of life. **RESULTS:** The study has commenced in the Australian states of Victoria and South Australia, and has enrolled 167 eligible cases to date (80 intervention and 87 control). Further sites are due to commence in 2019, recruitment is expected to take three years. **CONCLUSION:** This study will determine if early reduction of oxygen leads to improved outcomes in OHCA. Such a finding may potentially change clinical practice with implications on future OHCA survival outcomes. **TRIAL REGISTRATION NUMBER:** NCT03138005.

ECOGRAFIA

Sense articles

MONITORATGE CEREBRAL

1. Biomarkers. 2019 Apr 24:1-24. doi: 10.1080/1354750X.2019.1609580. [Epub ahead of print]

Serum tau fragments as predictors of death or poor neurological outcome after out-of-hospital cardiac arrest.

Grand J(1), Kjaergaard J(1), Nielsen N(2), Friberg H(3), Cronberg T(4), Bro-Jeppesen J(1), Karsdal MA(5), Nielsen HB(4), Frydland M(1), Henriksen K(5), Mattsson N(6)(7), Zetterberg H(8)(9)(10)(11), Hassager C(1).

Abstract

BACKGROUND: Anoxic brain injury is the primary cause of death after resuscitation from out-of-hospital cardiac arrest (OHCA) and prognostication is challenging. The aim of this study was to evaluate the potential of two fragments of tau as serum biomarkers for neurological outcome. **METHODS:** Single-center sub-study of 171 patients included in the Target Temperature Management (TTM) Trial randomly assigned to TTM at 33 °C or TTM at 36 °C for 24 hours after OHCA. Fragments (tau-A and tau-C) of the neuronal protein tau were measured in serum 24, 48 and 72 hours after OHCA. The primary endpoint was neurological outcome. **RESULTS:** Median (quartile 1 - quartile 3) tau-A (ng/ml) values were 58 (43-71) versus 51 (43-67), 72 (57-84) versus 71 (59-82) and 76 (61-92) versus 75 (64-89) for good versus unfavorable outcome at 24, 48, and 72 h, respectively ($p_{\text{group}} = 0.95$). Median tau C (ng/ml) values were 38 (29-50) versus 36 (29-49), 49 (38-58) versus 48 (33-59), and 48 (39-59) versus 48 (36-62) ($p_{\text{group}} = 0.95$). Tau-A and tau-C did not predict neurological outcome (area under the receiver-operating curve at 48 hours; tau-A: 0.51 and tau-C: 0.51). **CONCLUSIONS:** Serum levels of tau fragments were unable to predict neurological outcome after OHCA.

2. Resuscitation. 2019 Apr 18. pii: S0300-9572(19)30126-1. doi: 10.1016/j.resuscitation.2019.04.012. [Epub ahead of print]

Hippocampus and basal ganglia as potential sentinel sites for ischemic pathology after resuscitated cardiac arrest.

Haglund M(1), Lindberg E(2), Englund E(2).

Abstract

AIMS OF THE STUDY: Neurological impairment after resuscitated cardiac arrest (CA) remains a significant unmet medical need. Brain ischemia associated with CA and subsequent reperfusion is evident as two fundamentally different types of damage on neuropathological examination: frank necrosis (involving all cell types) and selective eosinophilic neuronal death (SEND). These types of damage are not only dissimilar in micromorphology, but also differently detectable with clinical brain imaging methods. In a previous study, SEND was reported in most patients surviving the initial CA. This study was undertaken to further characterize and map SEND in an expanded dataset. **METHODS:** A cohort of 46 cases was included from an observational study on targeted temperature management (TTM) of resuscitated CA. Six brain and brain stem regions and 21 subregions were examined, and SEND severity was tested for correlation with time to ROSC. Representativity of all regions vis-à-vis global SEND was assessed, to investigate whether any particular region could be used as a "sentinel site" for overall damage. **RESULTS:** The thalamus, the CA4 subregion of the hippocampus and the Purkinje cell layer of the cerebellum were the most severely affected subregions. Involvement of the hippocampus, cerebellum, cortex or basal ganglia indicated presence of SEND in other regions. There was a significant correlation between time to ROSC and SEND. **CONCLUSION:** There are regional differences in SEND distribution. Cases free of SEND in the hippocampus or basal ganglia are unlikely to have significant SEND in other regions, suggesting that these regions could be used as "sentinel sites" for global SEND in future studies.

ORGANITZACIÓ I FORMACIÓ

1. Can J Rural Med. 2019 Jan-Mar;24(1):13-17. doi: 10.4103/CJRM.CJRM_13_18.

CPRural.

Evans Z(1), Mcknight B(1).

Abstract

INTRODUCTION: The purpose of our study was to determine if regular cardiopulmonary resuscitation (CPR) practise improved the quality of nurses' chest compressions in a rural hospital. **METHODS:** The study was a prospective interventional trial measuring the effectiveness of brief, monthly CPR practice for rural nurses. The quality of nurses' chest compressions was measured before and after monthly practise with an interactive feedback device at the Golden and District Hospital, a rural facility in BC. **RESULTS:** All three components of high-quality CPR (depth, recoil and rate) improved significantly. **CONCLUSION:** Monthly practise of chest compressions with an interactive feedback device improved the quality and confidence of nurses' CPR skills. These results suggest that a higher frequency of CPR practice (than the minimum annual recertification) would improve both the quality and retention of CPR skills, specifically for low-volume rural hospitals.

FREE ARTICLE

2. Emerg Med J. 2019 May;36(5):266-272. doi: 10.1136/emered-2017-207431.

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).

Abstract

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.

FREE ARTICLE

3. Resuscitation. 2019 Apr 19. pii: S0300-9572(19)30136-4. doi: 10.1016/j.resuscitation.2019.04.019. [Epub ahead of print]

Large urban center improves out-of-hospital cardiac arrest survival.

Del Rios M(1), Weber J(2), Pugach O(3), Nguyen H(4), Campbell T(5), Islam S(6), Stein Spencer L(7), Markul E(8), Bunney EB(9), Vanden Hoek T(10).

Abstract

BACKGROUND: Large cities pose unique challenges that limit the effectiveness of system improvement interventions. Successful implementation of integrated cardiac resuscitation systems of care can serve as a model for other urban centers. **METHODS:** This was a retrospective analysis of prospectively collected data of adult cases of non-traumatic cardiac arrest who received treatment by Chicago Fire Department EMS from September 1, 2013 through December 31, 2016. We measured temporal OHCA outcomes during implementation of system-wide initiatives including telephone-assisted and community CPR training programs; high performance CPR and team based simulation training; new post resuscitation care and destination protocols; and case review for EMS providers. Outcomes measured included bystander CPR rates, return of spontaneous circulation (ROSC), hospital admission and survival, and favorable neurologic outcomes (CPC 1-2). Relative risk was determined by logistic regression model where observed group-specific outcomes are expressed as odds ratios (OR). **RESULTS:** We included 6103 adult OHCA cases occurring outside of health care facilities from September 1, 2013 through December 31, 2016. Significantly improved outcomes ($p < 0.05$) were observed between 2013 and 2016 for bystander CPR (11.6% vs 19.4%), ROSC (28.6% vs 36.9%), hospital admission (22.5% vs 29.4%), survival (7.3% vs 9.9%), and CPC 1-2 (4.3% vs 6.4%). Utstein survival increased from 16.3%-35.4% and CPC 1-2 survival from 11.6%-29.1% ($p < 0.05$). After adjustment for OHCA characteristics, survival with CPC 1-2 increased over time (OR 1.15, $p = 0.0277$). **CONCLUSIONS:** Densely populated cities with low survival rates can overcome systematic challenges and improve OHCA survival.

4. Resuscitation. 2019 Apr 18. pii: S0300-9572(19)30134-0. doi: 10.1016/j.resuscitation.2019.04.017. [Epub ahead of print]

Comparing bystander response to a sudden cardiac arrest using a virtual reality CPR training mobile app versus a standard CPR training mobile app.

Leary M(1), McGovern SK(2), Chaudhary Z(2), Patel J(2), Abella BS(3), Blewer AL(4).

Abstract

BACKGROUND: Using a mobile virtual reality (VR) platform to heighten realism for cardiopulmonary resuscitation (CPR) training has the potential to improve bystander response. **OBJECTIVES:** We examined whether using a VR mobile application (mApp) for CPR training would improve bystander response compared with a standard mApp CPR training. **METHODS:** We randomized lay bystanders to either our intervention arm (VR mApp) or our control arm (mApp). During a post-intervention skills test, we collected bystander response data (call 911, perform CPR, ask for an automated external defibrillator (AED)), along with CPR quality (chest compression (CC) rate and depth). Wilcoxon rank sum was used to analyze CC rate and CC depth as they were not normally distributed; Pearson's Chi-square was used to analyze Chain of Survival variables. **RESULTS:** Between 3/2018 and 9/2018, 105 subjects were enrolled: 52 VR mApp and 53 mApp. Mean age was 46 ± 16 years, 34% were female, 59% were Black, and 17% were currently CPR trained (≤ 2 years). Bystander response was significantly higher in the VR mApp arm: called 911 (82% vs 58%, $p = 0.007$) and asked for an AED (57% vs 28%, $p = 0.003$). However there was no difference in CPR performed (98% vs 98%, $p = \text{NS}$) and the application of the AED (90% vs 93%, $p = \text{NS}$). When comparing the VR mApp to the mApp, mean CC rate was 104 ± 42 cpm vs 112 ± 30 cpm ($p = \text{NS}$), and mean

CC depth was 38 ± 15 mm vs 44 ± 13 mm ($p = 0.05$). CONCLUSION: The use of the VR mApp significantly increased the likelihood of calling 911 and asking for an AED, however, CC depth was decreased.

5. S D Med. 2018 Feb;71(2):72-79.

Using Data Science to Provide Preliminary Estimates of Out-of-Hospital Cardiac Arrest in Rural South Dakota.

Samra HA(1), Sudhagoni RG(2), Kupersmidt S(3), Seiber MJ(4), Fuller MD(5), Pickthorn ST(5), Lowmiller K(1).

Abstract

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) is the cessation of electric or mechanical activity of the heart, confirmed by absence of circulation. Survival to hospital dismissal rates have remained low nationwide despite considerable effort to improve treatment. Current initiatives seek systems approaches that optimize care at each point along the "chain of survival." Systems approaches rely on the availability of robust data sets to understand and control variables that can be highly interdependent. The current report seeks to provide a source of reliable data of OHCA for South Dakota. **METHODS:** Using the "Utstein" guidelines for reviewing and reporting OHCA resuscitations issued by the American Heart Association in 2014, we analyzed the EMS data that were captured by ePCR between January 1, 2013 and December 31, 2015. Inclusion criteria were 911 calls in 2013-2015, where first impression of the call was cardiac arrest. Exclusion criteria were inconsistent and missing data. **RESULTS:** There were 1,781 OHCA in the ePCR, and 1,280 cases had survival information, with 378 victims surviving to ED. Overall, SD OHCA rates were lower than those reported nationally. Survival was the highest in patients with a shockable rhythm and when victim received bystander CPR. The odds for survival were greater if the arrest took place in an urban setting compared to a rural setting and if the victim received care from an EMS unit that did not have a "hardship" designation. **DISCUSSION:** Recommendations for future efforts include: (1) Develop and employ quality improvement methodologies for data collection and utilization to minimize the impact of poor or missing data, (2) Assess the educational and training needs of the EMS staff to properly collect, analyze, and develop actionable outputs, (3) Provide public training to include hands-only CPR and PulsePoint.

CURES POST-RCE

1. Catheter Cardiovasc Interv. 2018 Apr 1;91(5):832-839. doi: 10.1002/ccd.27199. Epub 2017 Aug 2.

Factors associated with performing urgent coronary angiography in out-of-hospital cardiac arrest patients.

Lam DH(1), Glassmoyer LM(2), Strom JB(3), Davis RB(4), McCabe JM(1), Cutlip DE(3), Donnino MW(5)(6), Cocchi MN(5)(7), Pinto DS(3).

Abstract

OBJECTIVES: Factors associated with performing urgent coronary angiography (UCA) in patients with out-of-hospital cardiac arrest (OHCA) were identified. **BACKGROUND:** Current guidelines for resuscitated OHCA patients recommend UCA if there is ST-elevation on post-arrest electrocardiogram or high suspicion of acute myocardial infarction. Some have advocated for UCA in all OHCA regardless of suspected etiology. The reasons for variations in performing UCA are not well understood. **METHODS:** A retrospective analysis of subjects presenting with resuscitated OHCA to a single academic medical center

from 12/15/2007 to 8/31/2014 was conducted. Demographic and clinical characteristics of patients undergoing UCA, defined as angiography within 6 hr of presentation, were compared with those not undergoing UCA. Logistic regression was used to determine predictors of UCA. RESULTS: A total of 323 resuscitated OHCA patients (mean age, 64 years; women, 35%) were included in the analysis; 107 (33.1%) underwent coronary angiography during their hospitalization and 66 (20.4%) underwent UCA. Multivariable adjusted factors associated with UCA were ST-elevation [odds ratio (OR) 14.66, 95% confidence interval (CI) 6.28-34.24, $P < 0.001$], initial shockable rhythm (OR 3.69, 95% CI 1.52-8.97, $P = 0.004$), and history of coronary artery disease (CAD) (OR 3.37, 95% CI 1.43-7.95, $P = 0.005$). Higher age (OR 0.71 per decade, 95% CI 0.55-0.92, $P = 0.01$) and obvious non-cardiac cause of arrest (OR 0.08, 95% CI 0.02-0.38, $P = 0.001$) were negatively associated with UCA. CONCLUSIONS: In resuscitated out-of-hospital cardiac arrest patients, ST-elevation, shockable rhythm, and history of CAD were associated with performing urgent coronary angiography; older patients and those with obvious non-cardiac causes of arrest were negatively associated.

FREE ARTICLE

2. PLoS One. 2018 Nov 5;13(11):e0206655. doi: 10.1371/journal.pone.0206655. eCollection 2018.

Acute liver dysfunction after cardiac arrest.

Iesu E(1), Franchi F(1)(2), Zama Cavicchi F(1), Pozzebon S(1)(2), Fontana V(1), Mendoza M(1)(3), Nobile L(1), Scolletta S(2), Vincent JL(1), Creteur J(1), Taccone FS(1).

Abstract

Few data are available regarding hypoxic hepatitis (HH) and acute liver failure (ALF) in patients resuscitated from cardiac arrest (CA). The aim of this study was to describe the occurrence of these complications and their association with outcome. All adult patients admitted to the Department of Intensive Care following CA were considered for inclusion in this retrospective study. Exclusion criteria were early death (<24 hours) or missing biological data. We retrieved data concerning CA characteristics and markers of liver function. ALF was defined as a bilirubin >1.2 mg/dL and an international normalized ratio ≥ 1.5 . HH was defined as an aminotransferase level >1000 IU/L. Neurological outcome was assessed at 3 months and an unfavourable neurological outcome was defined as a Cerebral Performance Categories (CPC) score of 3-5. A total of 374 patients (age 62 [52-74] years; 242 male) were included. ALF developed in 208 patients (56%) and HH in 27 (7%); 24 patients developed both conditions. Patients with HH had higher mortality (89% vs. 51% vs. 45%, respectively) and greater rates of unfavourable neurological outcome (93% vs. 60% vs. 59%, respectively) compared to those with ALF without HH ($n = 184$) and those without ALF or HH ($n = 163$; $p = 0.03$). Unwitnessed arrest, non-shockable initial rhythm, lack of bystander cardiopulmonary resuscitation, high adrenaline doses and the development of acute kidney injury were independent predictors of unfavourable neurological outcome; HH (OR: 16.276 [95% CIs: 2.625-81.345; $p = 0.003$]), but not ALF, was also a significant risk-factor for unfavourable outcome. Although ALF occurs frequently after CA, HH is a rare complication. Only HH is significantly associated with poor neurological outcome in this setting.

FREE ARTICLE

TARGETED TEMPERATURE MANAGEMENT

1. JPEN J Parenter Enteral Nutr. 2019 Apr 22. doi: 10.1002/jpen.1596. [Epub ahead of print]

Nutrition During Targeted Temperature Management After Cardiac Arrest: Observational Study of Neurological Outcomes and Nutrition Tolerance.

Martin M(1), Reignier J(1), Le Thuaut A(2)(3), Lacherade JC(4), Martin-Lefèvre L(4), Fiancette M(4), Vinatier I(4), Lebert C(4), Bachoumas K(5), Yehia A(4), Henry Lagarrigue M(4), Colin G(4), Lascarrou JB(1).

Abstract

BACKGROUND: Whether providing nutrition support is beneficial or deleterious during targeted temperature management (TTM) after cardiac arrest is unclear. We therefore performed a retrospective observational study to determine whether early nutrition was beneficial or deleterious during TTM. **METHODS:** We retrospectively studied patients admitted to our intensive care unit (ICU) between 2008 and 2014 after successfully resuscitated cardiac arrest. We compared the group given nutrition within 48 hours after ICU admission (E+ group) to the group given nutrition later on or not at all (E- group). **RESULTS:** Of the 203 included patients, 143 were in the E+ group and 60 in the E- group. The E+ group had a significantly higher proportion of patients with a good 3-month neurological outcome (42.7% vs 16.7%, $P < 0.001$). The difference remained significant after adjustment on a propensity score (odds ratio, 3.47; 95% confidence interval, 1.48-8.14; $P = 0.004$). The cumulative energy deficit for an energy goal of 20 kcal/kg/d from admission to day 7 was significantly lower in the E+ group (3304 ± 2863 kcal vs 5017 ± 2655 kcal, $P < 0.001$). Within the E+ group, the subgroups with nutrition initiation when body temperature was $<36^{\circ}\text{C}$ vs $\geq 36^{\circ}\text{C}$ were not significantly different regarding the frequencies of early-onset pneumonia, ventilator-associated pneumonia, vomiting, and prokinetic drug use (all P -values > 0.05). **CONCLUSIONS:** Early nutrition after cardiac arrest during TTM appears safe and may be associated with better neurological outcomes. These findings warrant a randomized controlled trial to resolve the remaining issues.

ELECTROFISIOLOGIA I DESFIBRIL·LACIÓ

1. Am Heart J. 2018 Jun;200:90-95. doi: 10.1016/j.ahj.2018.03.009. Epub 2018 Mar 13.

Coronary angiography in out-of-hospital cardiac arrest without ST elevation on ECG-Short- and long-term survival.

Elfwén L(1), Lagedal R(2), James S(3), Jonsson M(4), Jensen U(1), Ringh M(4), Claesson A(4), Oldgren J(5), Herlitz J(6), Rubertsson S(2), Nordberg P(4).

Abstract

BACKGROUND: The potential benefit of early coronary angiography in out-of-hospital cardiac arrest (OHCA) patients without ST elevation on ECG is unclear. The aim of this study was to evaluate the association between early coronary angiography and survival in these patients. **METHODS:** Nationwide observational study between 2008 and 2013. Included were patients admitted to hospital after witnessed OHCA, with shockable rhythm, age 18 to 80 years and unconscious. Patients with ST-elevation on ECG were excluded. Patients that underwent early CAG (within 24 hours) were compared with no early CAG (later during the hospital stay or not at all). Outcomes were survival at 30 days, 1 year, and 3 years. Multivariate analysis included pre-hospital factors, comorbidity and ECG-findings. **RESULTS:** In total, 799 OHCA patients fulfilled the inclusion criteria, of which 275 (34%) received early CAG versus 524 (66%) with no early CAG. In the early CAG group, the proportion of patients with an occluded coronary artery was 27% and 70% had at least one significant coronary stenosis (defined as narrowing of coronary lumen diameter of $\geq 50\%$). The 30-day survival rate was 65% in early CAG group versus 52% with no early CAG ($P < .001$). The adjusted OR was 1.42 (95% CI 1.00-2.02). The one-year survival rate was 62% in the early CAG group versus 48% in the no early CAG group with the adjusted hazard ratio of 1.35 (95% CI 1.04-1.77). **CONCLUSION:** In this population of bystander-witnessed cases of out-of-hospital cardiac arrest with

shockable rhythm and ECG without ST elevation, early coronary angiography may be associated with improved short and long term survival.

2. Indian Pacing Electrophysiol J. 2019 Apr 22. pii: S0972-6292(19)30049-X. doi: 10.1016/j.ipej.2019.04.005. [Epub ahead of print]

Change in myocardial function after resuscitated sudden cardiac arrest and its impact on long-term mortality and defibrillator implantation.

Gupta A(1), Gupta A(2), Saba S(3).

Abstract

BACKGROUND: The impact of left ventricular ejection fraction (LVEF) changes after sudden cardiac arrest (SCA) on implantable defibrillator (ICD) utilization and long-term survival is not known. We therefore evaluated the influence of LVEF on these parameters in SCA survivors. **METHODS:** Data were collected on consecutive SCA survivors who had ≥ 1 echocardiogram after SCA and who survived to hospital discharge (n = 655). The median time from baseline to first follow-up echocardiogram was 162 days. LVEF $\geq 50\%$ was defined as normal. Patients were classified into 4 groups according to baseline (LVEFb) and follow-up (LVEFf) myocardial function: normal LVEFb and LVEFf (group 1, n = 261); reduced LVEFb and normal LVEFf (group 2, n = 104); normal LVEFb but reduced LVEFf (group 3, n = 41); and reduced LVEFb and LVEFf (group 4, n = 249). All-cause mortality and time to ICD implantation were examined in all groups. **RESULTS:** Over a median follow up of 4.3 years, death occurred in 279 (42%) of patients. Compared with patients in group 1, patients with any reduced LVEF at any time (groups 2-4) had significantly higher mortality, even after adjusting for unbalanced covariates (HR = 1.44, 95.0% CI 1.05-1.95, p = 0.022). ICDs were most commonly implanted in patients with persistently reduced LVEF (group 4: HR = 1.72, 95% CI = 1.26-2.35, p = 0.001). **CONCLUSION:** We demonstrate that, in survivors of SCA, a reduced LVEF at or after the index event is associated with higher mortality but that patients with persistently reduced LVEF were most likely to receive ICD therapy. These findings have implications on the management of SCA survivors.

FREE ARTICLE

EXTRACORPOREAL LIFE SUPPORT

1. Catheter Cardiovasc Interv. 2019 Apr 25. doi: 10.1002/ccd.28307. [Epub ahead of print]

Improved Outcomes Associated with the use of Shock Protocols: Updates from the National Cardiogenic Shock Initiative.

Basir MB(1), Kapur NK(2), Patel K(3), Salam MA(3), Schreiber T(4), Kaki A(4), Hanson I(5), Almany S(5), Timmis S(5), Dixon S(5), Kolski B(6), Todd J(7), Senter S(8), Marso S(9), Lasorda D(10), Wilkins C(11), Lalonde T(4), Attallah A(4), Larkin T(12), Dupont A(13), Marshall J(13), Patel N(14), Overly T(15), Green M(16), Tehrani B(17), Truesdell AG(17), Sharma R(18), Akhtar Y(19), McRae T 3rd(20), O'Neill B(21), Finley J(22), Rahman A(23), Foster M(24), Askari R(25), Goldsweig A(26), Martin S(27), Bharadwaj A(28), Khuddus M(29), Caputo C(29), Korpas D(30), Cawich I(31), McAllister D(32), Blank N(33), Alraies MC(33), Fisher R(1), Khandelwal A(1), Alaswad K(1), Lemor A(1), Johnson T(1), Hacala M(1), O'Neill WW(1); National Cardiogenic Shock Initiative Investigators.

Abstract

BACKGROUND: The National Cardiogenic Shock Initiative is a single-arm, prospective, multicenter study to assess outcomes associated with early mechanical circulatory support (MCS) in patients presenting with acute myocardial infarction and cardiogenic shock (AMICS) treated with percutaneous coronary intervention (PCI). **METHODS:** Between July 2016 and February 2019, 35 sites participated and enrolled into the study. All centers agreed to treat patients with AMICS using a standard protocol emphasizing invasive hemodynamic monitoring and rapid initiation of MCS. Inclusion and exclusion criteria mimicked those of the "SHOCK" trial with an additional exclusion criteria of intra-aortic balloon pump counterpulsation prior to MCS. **RESULTS:** A total of 171 consecutive patients were enrolled. Patients had an average age of 63 years, 77% were male, and 68% were admitted with AMICS. About 83% of patients were on vasopressors or inotropes, 20% had a witnessed out of hospital cardiac arrest, 29% had in-hospital cardiac arrest, and 10% were under active cardiopulmonary resuscitation during MCS implantation. In accordance with the protocol, 74% of patients had MCS implanted prior to PCI. Right heart catheterization was performed in 92%. About 78% of patients presented with ST-elevation myocardial infarction with average door to support times of 85 ± 63 min and door to balloon times of 87 ± 58 min. Survival to discharge was 72%. Creatinine ≥ 2 , lactate >4 , cardiac power output (CPO) <0.6 W, and age ≥ 70 years were predictors of mortality. Lactate and CPO measurements at 12-24 hr reliably predicted overall mortality postindex procedure. **CONCLUSION:** In contemporary practice, use of a shock protocol emphasizing best practices is associated with improved outcomes.

2. Resuscitation. 2019 Apr 22. pii: S0300-9572(18)30967-5. doi: 10.1016/j.resuscitation.2019.04.025. [Epub ahead of print]

Cut-off values of serum potassium and core temperature at hospital admission for extracorporeal rewarming of avalanche victims in cardiac arrest: A retrospective multi-centre study.

Brugger H(1), Bouzat P(2), Pasquier M(3), Mair P(4), Fieler J(5), Darocha T(6), Blancher M(7), de Riedmatten M(8), Falk M(9), Paal P(10), Strapazzon G(11), Zafren K(12), Brodmann Maeder M(13).

Abstract

AIM: Evidence of existing guidelines for the on-site triage of avalanche victims is limited and adherence suboptimal. This study attempted to find reliable cut-off values for the identification of hypothermic avalanche victims with reversible out-of-hospital cardiac arrest (OHCA) at hospital admission. This may enable hospitals to allocate ECLS resources more appropriately while increasing the proportion of survivors among rewarmed victims. **METHODS:** All avalanche victims with OHCA admitted to seven centres in Europe capable of ECLS from 1995 to 2016 were included. Optimal cut-off values, for parameters identified by logistic regression, were determined by means of bootstrapping and exact binomial distribution and served to calculate sensitivity, rate of overtriage, positive and negative predictive values, and receiver operating curves. **RESULTS:** In total, 103 avalanche victims with OHCA were included. Of the 103 patients 61 (58%) were rewarmed by ECLS. Six (10%) of the rewarmed patients survived whilst 55 (90%) died. We obtained optimal cut-off values of 7 mmol/L for serum potassium and 30 °C for core temperature. **CONCLUSION:** For in-hospital triage of avalanche victims admitted with OHCA, serum potassium accurately predicts survival. The combination of the cut-offs 7 mmol/L for serum potassium and 30 °C for core temperature achieved the lowest overtriage rate (47%) and the highest positive predictive value (19%), with a sensitivity of 100% for survivors. The presence of vital signs at extrication is strongly associated with survival. For further optimisation of in-hospital triage, larger datasets are needed to include additional parameters.

3. Resuscitation. 2019 Apr 19. pii: S0300-9572(19)30139-X. doi: 10.1016/j.resuscitation.2019.04.022. [Epub ahead of print]

Impella use in acute myocardial infarction complicated by cardiogenic shock and cardiac arrest: Analysis of 10 years registry data.

Davidson C(1), Packer EJS(2), Løland KH(2), Rotevatn S(2), Nygreen EL(2), Eriksen E(2), Øksnes A(2), Herstad J(2), Haaverstad R(3), Bleie Ø(2), Tuseth V(3).

Abstract

AIMS: To assess characteristics and outcome of patients treated with Impella for acute myocardial infarction (AMI) complicated by severe cardiogenic shock (CS) or cardiac arrest (CA). **METHODS AND RESULTS:** From 2008 through 2017, 92 patients with AMI complicated by CS were treated with Impella. Survival varied according to clinical presentation. Patients in cardiogenic shock without CA had a 75% 30-day survival. Patients with CA and return of spontaneous circulation (ROSC) had a 43% survival and those with CA and ongoing cardio-pulmonary resuscitation (CPR) had a 6% 30-day survival. Age, pre-existing hypertension, coronary disease, ventilatory support and use of adrenergic agents were associated with worse prognosis. Complications were predominantly access site related. **CONCLUSIONS:** In this registry of patients with AMICS treated with Impella, hypertension and older age were found to be negatively predictive for survival. Patients without CA had the highest 30-day survival. In patients with ROSC, survival was strongly related to age and comorbidity. Patients with ongoing CPR had very high mortality.

PEDIATRIA

1. Circulation. 2019 Apr 22. doi: 10.1161/CIRCULATIONAHA.118.039048. [Epub ahead of print]

Pulselessness After Initiation of Cardiopulmonary Resuscitation for Bradycardia in Hospitalized Children: Prevalence, Predictors of Survival, and Implications for Hospital Profiling.

Khera R(1), Tang Y(2), Girotra S(3), Nadkarni VM(4), Link MS(1), Raymond TT(5), Guerguerian AM(6), Berg RA(4), Chan PS(7).

Abstract

BACKGROUND: Cardiopulmonary resuscitation (CPR) is initiated in hospitalized children with bradycardia and poor perfusion. However, their rate of progression to pulseless cardiac arrest despite CPR, and differences in survival compared with initially pulseless arrest are unknown. We examined the prevalence and predictors of survival of children who progress from bradycardia to pulseless in-hospital cardiac arrest despite CPR. **METHODS:** Pediatric patients, aged >30 days and <18 years, who received CPR at hospitals participating in Get With The Guidelines-Resuscitation during 2000-2016 were included. Each CPR event was classified as bradycardia with pulse, bradycardia with subsequent pulselessness, and initial pulseless cardiac arrest. We assessed for risk-adjusted rates of survival to hospital discharge using multilevel Poisson regression models. **RESULTS:** Overall, 5592 pediatric patients were treated with CPR, of whom 2799 (50.1%) received CPR for bradycardia with poor perfusion and 2793 (49.9%) for initial pulseless cardiac arrest. Among those with bradycardia, 869 (31.0%, or 15.5% of cohort) became pulseless after a median of 3 minutes of CPR (IQR 1, 9). Rates of survival to discharge were 70.0% (1351/1930) for bradycardia with pulse, 30.1% (262/869) for bradycardia progressing to pulselessness, and 37.5% (1046/2793) for initial pulseless cardiac arrest (P for difference across groups <.001). Children who became pulseless despite CPR for bradycardia had a 19% lower likelihood (RR 0.81 [95% CI: 0.70, 0.93]; P=0.004) of surviving to hospital discharge than those initially pulseless. Among children who progressed to pulselessness despite CPR for bradycardia, a longer interval between CPR and pulselessness was a predictor of lower survival (reference: <2 minutes, for 2-5 minutes: RR 0.54 [95% CI: 0.41, 0.70]; for >5 minutes: RR 0.41 [95% CI: 0.32, 0.53]). **CONCLUSIONS:** Among hospitalized children in whom CPR is initiated, half have bradycardia with poor perfusion at the initiation of chest compressions, and nearly one-third of these progress to pulseless

in-hospital cardiac arrest despite CPR. Survival was significantly lower for children who progress to pulselessness despite CPR, compared to those who were initially pulseless. These findings suggest that pediatric patients who lose their pulse despite resuscitation attempts are at particularly high-risk and require a renewed focus on post-resuscitation care.

RECERCA EXPERIMENTAL

1. J Thorac Cardiovasc Surg. 2019 Mar 6. pii: S0022-5223(19)30559-8. doi: 10.1016/j.jtcvs.2019.02.091. [Epub ahead of print]

Transcriptome profiling reveals activation of inflammation and apoptosis in the neonatal striatum after deep hypothermic circulatory arrest.

Tu LN(1), Timms AE(2), Kibiryeveva N(3), Bittel D(4), Pastuszko A(5), Nigam V(1), Pastuszko P(6).

Abstract

OBJECTIVES: Brain injury, leading to long-term neurodevelopmental deficits, is a major complication in neonates undergoing cardiac surgeries. Because the striatum is one of the most vulnerable brain regions, we used mRNA sequencing to unbiasedly identify transcriptional changes in the striatum after cardiopulmonary bypass and associated deep hypothermic circulatory arrest. **METHODS:** Piglets were subjected to cardiopulmonary bypass with deep hypothermic circulatory arrest at 18°C for 30 minutes and then recovered for 6 hours. mRNA sequencing was performed to compare changes in gene expression between the striatums of sham control and deep hypothermic circulatory arrest brains. **RESULTS:** We found 124 significantly upregulated genes and 74 significantly downregulated genes in the striatums of the deep hypothermic circulatory arrest group compared with the sham controls. Pathway enrichment analysis demonstrated that inflammation and apoptosis were the strongest pathways activated after surgery. Chemokines CXCL9, CXCL10, and CCL2 were the top upregulated genes with 32.4-fold, 22.2-fold, and 17.6-fold increased expression, respectively, in the deep hypothermic circulatory arrest group compared with sham controls. Concomitantly, genes involved in cell proliferation, cell-cell adhesion, and structural integrity were significantly downregulated in the deep hypothermic circulatory arrest group. Analysis of promoter regions of all upregulated genes revealed over-representation of nuclear factor-κB transcription factor binding sites. **CONCLUSIONS:** Our study provides a comprehensive view of global transcriptional changes in the striatum after deep hypothermic circulatory arrest and found strong activation of both inflammatory and apoptotic signaling pathways in the deep hypothermic circulatory arrest group. Nuclear factor-κB, a key driver of inflammation, appears to be an upstream regulator of the majority of the upregulated genes; hence, nuclear factor-κB inhibitors could potentially be tested for beneficial effects on neurologic outcome.

2. Med Eng Phys. 2019 Apr 18. pii: S1350-4533(19)30056-6. doi: 10.1016/j.medengphy.2019.03.011. [Epub ahead of print]

A predictive computational model to estimate myocardial temperature during intracoronary hypothermia in acute myocardial infarction.

van Willigen BG(1), Otterspoor LC(2), van 't Veer M(3), Rosalina TT(4), Pijls NHJ(3), van de Vosse FN(4).

Abstract

Hypothermia, if provided before coronary reperfusion, reduces infarct size in animal models of acute myocardial infarction (AMI). Translation to humans has failed so far, because the target temperature is not reached in time within the endangered myocardium using systemic hypothermia method. Hence, a clinically applicable method has been developed to provide intracoronary hypothermia using cold saline, selectively infused locally into the infarct area. In this study, a lumped parameter model has been designed to support the clinical method and to describe this myocardial cooling process mathematically. This model is able to predict the myocardial temperature changes over time, which cannot be measured, based on the temperature and flow of the intracoronary injected cold saline and coronary arterial blood. It was validated using data from an isolated beating porcine heart model and applied on data from patients with AMI undergoing intracoronary hypothermia. In prospect, the computational model may be used as an assistive tool to calculate the patient specific flow rate and temperature of saline required for reliable achievement of the target myocardial temperature in the hypothermia enhanced clinical treatment of AMI.

3. Ren Fail. 2019 Nov;41(1):278-283. doi: 10.1080/0886022X.2019.1596819.

The incidence of acute kidney injury following cardiac arrest and cardiopulmonary resuscitation in a rat model.

Fu ZY(1), Wu ZJ(1), Zheng JH(1), Qin T(1), Yang YG(1), Chen MH(1).

Abstract

OBJECTIVE: In the current study, we investigated the incidence of acute kidney injury (AKI) induced by cardiac arrest (CA) and cardiopulmonary resuscitation (CPR) and whether such an AKI can recover spontaneously in rats. **METHODS:** We used transesophageal alternating current stimulation to establish 7 min of CA rat model followed by conventional CPR. The experimental rats were randomly divided into three groups (n = 20 per group) according to the different time points after restoration spontaneous circulation (ROSC): the ROSC 24 h, ROSC 48 h, and ROSC 72 h group. The diagnosis of rat AKI refers to the 2012 KDIGO adult AKI diagnostic criteria. The severity of AKI quantified by the serum creatinine (SCR), blood urea nitrogen (BUN) levels and histological features of renal tissue. **RESULTS:** The incidence rates of AKI in ROSC 24 h, ROSC 48 h, and ROSC 72 h group were 65%, 45%, and 42.9%. Moreover, the values of SCR and BUN were highest at ROSC 24 h, and then gradually decreased with the time of ROSC. The histological changes of the renal tissues such as glomerular collapse, renal tubular cell swelling, and inflammatory cell infiltration had also observed. **CONCLUSION:** The incidence of AKI in rats was high after suffering from CA and CPR, but renal function improved with the prolongation of ROSC time, indicating the ability of the kidney to self-repair.

FREE ARTICLE

4. Resuscitation. 2019 Apr 22. pii: S0300-9572(19)30138-8. doi: 10.1016/j.resuscitation.2019.04.021. [Epub ahead of print]

Usefulness of Neuron Specific Enolase in prognostication after cardiac arrest: impact of age and time to ROSC.

Wihersaari L(1), Tiainen M(2), Skrifvars MB(3), Bendel S(4), Kaukonen KM(5), Vaahersalo J(3), Romppanen J(6), Pettilä V(3), Reinikainen M(7); FINNRESUSCI study group.

Abstract

AIM OF THE STUDY: We evaluated the impact of patient age and time from collapse to return of spontaneous circulation (ROSC) on the prognostic accuracy of neuron specific enolase (NSE) after out-of-

hospital cardiac arrest (OHCA). **METHODS:** Using electrochemiluminescence immunoassay, we measured serum concentrations of NSE in 249 patients who were admitted to intensive care units after resuscitation from OHCA. In each quartile according to age and time to ROSC, we evaluated the ability of NSE at 48 h after OHCA to predict poor outcome (Cerebral Performance Category 3-5) at 12 months. **RESULTS:** The outcome at 12 months was poor in 121 (49%) patients. The prognostic performance of NSE was excellent (area under the receiver operating characteristic curve, AUROC, 0.91 [95% confidence interval, 0.81-1.00]) in the youngest quartile (18-53 years), but worsened with increasing age, and was poor (AUROC 0.53 [0.37-0.70]) in the oldest quartile (72 years or more). The prognostic performance of NSE was worthless (AUROC 0.45 [0.30-0.61]) in the quartile with the shortest time to ROSC (1-13 min), but improved with increasing time to ROSC, and was good (AUROC 0.84 [0.74-0.95]) in the quartile with the longest time to ROSC (29 min or over). **CONCLUSION:** NSE at 48 h after OHCA is a useful predictor of 12-month-prognosis in young patients and in patients with a long time from collapse to ROSC, but not in old patients or patients with a short time to ROSC.

5. Resuscitation. 2019 Apr 19. pii: S0300-9572(19)30137-6. doi: 10.1016/j.resuscitation.2019.04.020. [Epub ahead of print]

Effect of endotracheal intubation and supraglottic airway device placement during cardiopulmonary resuscitation on carotid blood flow over resuscitation time: An experimental porcine cardiac arrest study.

Kim TH(1), Hong KJ(2), Shin SD(3), Lee JC(4), Choi DS(5), Chang I(6), Joo YH(7), Ro YS(8), Song KJ(9).

Abstract

BACKGROUND: Supraglottic airway devices (SGDs) are widely used during the resuscitation of out-of-hospital cardiac arrest (OHCA). The effect of SGDs on carotid blood flow (CBF) as resuscitation time passes is controversial. We assessed the effects of endotracheal intubation (ETI) and 3 types of SGD placement on CBF over time in prolonged resuscitation through an experimental porcine cardiac arrest study. **METHODS:** We conducted a randomized crossover study using 12 female pigs. After 4 min of untreated ventricular fibrillation, 3 pairs of ETI for 3 min and each type of SGD placement, including Combitube, I-gel, and laryngeal mask airway, for 3 min were conducted. The order of the 3 pairs of ETI and SGD were randomly assigned for each pig. We measured physiological parameters including CBF and mean arterial pressure (MAP). We compared CBF and MAP between the last 1 min of the insertion period for each of the 3 types of SGD and the preceding ETI period. Trends of CBF and MAP according to ETI and SGD transition were also plotted during the prolonged resuscitation duration. **RESULTS:** CBF decreased after inserting I-gel and Combitube compared to ETI (mean difference (95% CI): -685 ml (-1052 to -318) for Combitube, -369 ml (-623 to -114) for I-gel). MAP subsequently decreased after transitioning airway devices as resuscitation was prolonged, regardless of the device type. The mean CBF during the transition from ETI to SGD decreased by -480 ml (95% CI: -675 to -286), but the decrease in CBF during the transition from SGD to ETI was only -4 ml (95% CI: -182 to 175). **CONCLUSION:** SGD placement was associated with decreased carotid blood flow during cardiopulmonary resuscitation in an experimental porcine model. As time passed during prolonged resuscitation, reduction in CBF was aggravated after the transition to SGD placement compared to the reduction after the transition to ETI. This study was approved by the study institution IACUC 16-0140-S1A0.

CASE REPORTS

1. Am J Hematol. 2018 Mar;93(3):469-470. doi: 10.1002/ajh.24989. Epub 2017 Dec 18.

Anthracycline-induced acute myocarditis and ventricular fibrillation arrest.

Pallazola VA(1), Murray JC(1), Al Harthy M(2), Zimmerman SL(3), Webster J(4), Gondek LP(4).

NO ABSTRACT

FREE ARTICLE

2. Echocardiography. 2019 Apr 26. doi: 10.1111/echo.14345. [Epub ahead of print]

A Kaleidoscope heart.

Ntalas I(1)(2), Freitas D(1), Gowland A(1), Rajani R(1)(2).

Abstract

In the current manuscript, we report an unusual case of a young 18-year-old woman who survived an out-of-hospital cardiac arrest secondary to Bland-White-Garland syndrome. Her transthoracic echocardiogram showed an abnormal color Doppler flow-pattern within the myocardium indicative of coronary fistulous flow that prompted further evaluation with coronary CT angiography, which confirmed the diagnosis. Our case serves not only as a reminder to consider coronary artery anomalies as a cause of sudden cardiac death in young individuals but also as a prompt to investigate unusual echocardiographic findings with alternative imaging when the diagnosis may not be initially clear.

3. Eur Heart J Case Rep. 2018 Jul 27;2(3):ytyo88. doi: 10.1093/ehjcr/ytyo88. eCollection 2018 Sep.

Severe ischaemic cardiogenic shock with cardiac arrest and prolonged asystole: a case report.

Strangl F(1), Schwarzl M(1), Schrage B(1), Söffker G(2).

Abstract

BACKGROUND: Extracorporeal life support (ECLS) by veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is a valuable treatment option during severe cardiogenic shock and during cardiac arrest unresponsive to conventional management. It is applied to bridge the first critical days until the patient recovers or a destination therapy is established.¹ Prolonged episodes without cardiac electrical activity during VA-ECMO are a major problem, as they may cause pulmonary oedema and severe left ventricular (LV) thrombosis.² Here, we report a case of a 50-year-old man who presented with a 30-h episode of complete absence of electromechanical activity during ECLS and finally recovered with favourable neurological outcome. **CASE SUMMARY:** A 50-year-old man with out-of-hospital cardiac arrest was transferred to a peripheral hospital after initial successful cardiopulmonary resuscitation (CPR). In the emergency room, he presented with ST-segment elevation myocardial infarction and cardiogenic shock with third-degree atrioventricular block. After immediate insertion of a temporary pacemaker, he received percutaneous coronary intervention of the left anterior descending artery and the circumflex artery. Due to worsening cardiogenic shock, ECLS with VA-ECMO and an Impella[®] pump was established. Cumulative time of CPR (out of hospital and in hospital) was 41 min. After transfer to our institution's intensive care unit, both the heart's mechanical and electrical activity ceased for more than 24 h and recovered slowly thereafter. After showing promising neurological outcome, epicardial pacemaker leads, an implantable cardioverter-defibrillator, and finally, a LV assist device were implanted. He was dismissed into rehabilitation with only minor neurological residua 6 weeks later. **DISCUSSION:** Impella[®] implantation on top of VA-ECMO may be considered beneficial in the therapy of prolonged cardiac arrest.³ While VA-ECMO ensures oxygenation and organ perfusion, Impella[®] vents the left ventricle and enhances coronary

perfusion. In the presented case, a favourable outcome was reached despite an 'untreated' prolonged absence of cardiac electromechanical activity. Under specific circumstances during ECLS with extracorporeal membrane oxygenation and Impella®, waiving of temporary pacing may be considered in absent cardiac electromechanical activity to avoid further complications.

FREE ARTICLE

4. Eur Heart J Case Rep. 2018 Jul 2;2(3):yty076. doi: 10.1093/ehjcr/yty076. eCollection 2018 Sep.

Vasopressin antagonist-like effect of acetazolamide in a heart failure patient: a case report.

Kataoka H(1).

Abstract

BACKGROUND: Hyponatraemia is easily corrected by treatment with an oral vasopressin antagonist, but these medications are costly and their use at outpatient clinics is restricted by government-managed insurance in Japan. Acetazolamide could be an alternative diuretic to a vasopressin antagonist. **CASE SUMMARY:** An 83-year-old dyspnoeic male patient was emergently admitted to the hospital due to decompensated heart failure (HF), hypotension, and hyperkalaemia-associated sinus arrest with a junctional escape rhythm. Urgent treatment with a noradrenaline drip infusion and a beta stimulant adhesive skin patch promptly restored sinus rhythm with conducted normal QRS complex, which resolved the hypotension. Blood tests on admission revealed moderately elevated b-type natriuretic peptide (BNP, 576 pg/mL), hyponatraemia (128 mEq/L), hypochloraemia (95 mEq/L), hyperkalaemia (5.7 mEq/L), and preserved renal function (creatinine, 1.0 mg/dL) under no cardiovascular medications. Immediately after admission, low-dose oral acetazolamide (500 mg/day) and polystyrene sulfonate-Ca jelly (Argamate, 25 g/day for 3 days) were prescribed to correct the decompensated HF status and electrolyte disturbance. Three days later, both the serum sodium and chloride concentrations had recovered to normal levels (136 mEq/L and 104 mEq/L, respectively), and the serum potassium concentration had decreased to 4.5 mEq/L. Two weeks later, the patient's HF status became stable and the serum BNP concentration returned to normal (55 pg/mL). **DISCUSSION:** The present case indicates that the classic diuretic of acetazolamide would have a vasopressin blockade-like effect and could be an alternative diuretic to vasopressin antagonists for some proportion of HF patients with hyponatraemia.

FREE ARTICLE

5. Eur Heart J Case Rep. 2018 May 9;2(2):yty057. doi: 10.1093/ehjcr/yty057. eCollection 2018 Jun.

Gastropericardial fistula presenting with cardiac arrest: a case report.

Hervik K(1), Vognild I(2), Bjerke LM(3), Almdahl SM(1).

Abstract

INTRODUCTION: Gastropericardial fistulas are rare conditions, with less than 100 reported cases. The diagnosis is associated with significant morbidity, prolonged hospitalization and often has a fatal outcome. **CASE PRESENTATION:** We describe a unique case of cardiac arrest caused by pneumopericardium and cardiac tamponade as the acute presentation of a gastropericardial fistula, in a patient admitted with an infection of unknown origin. Rapid return of spontaneous circulation occurred, and a computed tomography scan revealed the diagnosis. A benign penetrating ulcer was found on gastroscopy, and surgical management with laparotomy and gastrorrhaphy was performed. The patient had no risk factors for gastric ulceration. However, he had significant comorbidity, which makes survival through a complicated postoperative course to full recovery remarkable. **DISCUSSION:** This case shows

that pneumopericardium due to a penetrating benign gastric ulcer can cause cardiac tamponade, and illustrates the value of a multidisciplinary approach to management.

FREE ARTICLE

6. Eur Heart J Case Rep. 2018 May 15;2(2):yty044. doi: 10.1093/ehjcr/yty044. eCollection 2018 Jun.

Right coronary anomaly in a patient with myocarditis and cardiac arrest: a case report.

Oberli LS(1), Haegeli LM(1)(2), Heidecker B(1).

Abstract

INTRODUCTION: Management of coronary anomalies continues to be a controversial topic in medicine, for which only in specific clinical scenarios recommendations for management are clearly defined. We are presenting a previously healthy 18-year-old patient who survived sudden cardiac death (SCD). Multiple potential aetiologies were evaluated, including malignant coronary anomaly, acute myocarditis, potential Brugada type 3 electrocardiographic pattern, and urine drug screening positive for lysergic acid diethylamide (LSD). **CASE PRESENTATION:** Malignant right coronary anomaly with interarterial course and acute angle takeoff was diagnosed with coronary computed tomography angiography. Signs of acute myocarditis were detected in cardiac magnetic resonance imaging and endomyocardial biopsy. Due to potential Brugada type 3 electrocardiographic pattern flecainide provocation testing was performed to rule out Brugada Syndrome. Confirmatory chromatography revealed that prior LSD drug screening was false positive. Ultimately, the patient underwent cardiothoracic surgery with unroofing of the right coronary artery. Subsequent clinical course was favourable. **DISCUSSION:** Right coronary artery anomalies are more prevalent than left coronary anomalies but less often associated with SCD. Interarterial course and acute angle takeoff are risk factors for unfavourable outcomes. Myocarditis is a potential trigger of arrhythmias and SCD. In patients with Brugada type 2 and 3 electrocardiographic pattern (saddleback ST-segment elevation), provocation testing with flecainide, ajmalin, or procainamide can be used to unmask Brugada type 1 electrocardiographic pattern. Due to the proarrhythmic potential of many recreational drugs, screening for these substances can be useful in young adults presenting after cardiac arrest; cross-reaction of substances as in our patient have to be considered.

FREE ARTICLE

7. Eur Heart J Case Rep. 2018 Apr 10;2(2):yty042. doi: 10.1093/ehjcr/yty042. eCollection 2018 Jun.

A 16-year-old boy with bronchial asthma and Prinzmetal angina: case report.

Baghdasaryan L(1).

Abstract

INTRODUCTION: Prinzmetal's angina is a very rare disease in children and adolescents. Adults' studies suggest that vasospastic angina is more common in patients with bronchial asthma than in the general population. **CASE PRESENTATION:** A 16-year-old boy with a history of bronchial asthma was admitted to the hospital after successful resuscitation from asystole. On the day of admission, he had a severe left shoulder pain and developed cardiac arrest. He was complaining of left shoulder pain throughout the previous year. During his hospital stay, a second cardiac arrest took place with inferior ST elevation of the electrocardiography recorded after the second successful resuscitation. Diagnostic coronary angiography revealed multiple spasms throughout the coronary bed, which was completely resolved after intracoronary nitroglycerine administration. The patient was diagnosed Prinzmetal's vasospastic angina,

and the symptoms disappeared gradually with up-titration of a calcium channel blocker and a nitrate. DISCUSSION: Previous studies have suggested that the pathogenesis of Prinzmetal's vasospastic angina may be similar to that of bronchial asthma, as we see in the presentation of this young patient.

FREE ARTICLE

8. Eur Heart J Case Rep. 2018 Apr 17;2(2):yty041. doi: 10.1093/ehjcr/yty041. eCollection 2018 Jun.

Sniff of coke breaks the heart: cocaine-induced coronary vasospasm aggravated by therapeutic hypothermia and vasopressors after aborted sudden cardiac death: a case report.

Manninger M(1), Perl S(1), Brussee H(1), G Toth G(1).

Abstract

INTRODUCTION: Coronary vasospasm and sudden cardiac death are a frequently reported complication of cocaine abuse. We present a case with uniquely severe clinical and angiographic presentation. CASE PRESENTATION: A 39-year-old patient was presented to the cath lab after out-of-hospital cardiac arrest. Coronary angiography revealed focal coronary vasospasm in the proximal LCx, well responsive for intracoronary nitrates. Accordingly, no coronary intervention was performed and the patient was transferred to the cardiac intensive care unit. There, after systematically cooling sudden haemodynamic deterioration and massive ST-elevation was observed. Repeated coronary angiography revealed subocclusive LAD and LCx vasospasm, which again recovered after intracoronary injection of nitric oxide. DISCUSSION: Coronary-spastic effect of cocaine and its potentially dreadful clinical consequences are well-described phenomena. As novelty this case emphasizes that standard of care, including systematic hypothermia and vasopressor administration after out-of-hospital cardiac arrest can potentiate cocaine-induced coronary spasm with dramatic outcomes.

FREE ARTICLE

9. Eur Heart J Case Rep. 2018 Nov 27;2(4):yty134. doi: 10.1093/ehjcr/yty134. eCollection 2018 Dec.

A case report: haemodynamic instability due to true dynamic left ventricular outflow tract obstruction and systolic anterior motion following resuscitation: reversal of haemodynamics on supportive veno-arterial extracorporeal membrane oxygenation.

Oxlund CS(1), Poulsen MK(1), Jensen PB(2), Veien KT(1), Møller JE(1).

Abstract

BACKGROUND: Obstruction of the left ventricular outflow tract (LVOT) as seen in hypertrophic cardiomyopathy is a dynamic condition with a wide range of clinical presentations and symptoms. CASE SUMMARY: We report the use of veno-arterial extracorporeal membrane oxygenation in a female patient who was resuscitated after out-of-hospital cardiac arrest. Soon after admission the patient developed critical haemodynamic compromise due to severe obstruction of the left ventricle outflow tract and systolic anterior motion (SAM) of the mitral valve. Veno-arterial extracorporeal membrane oxygenation restored haemodynamics and was weaned after 4 days without any haemodynamic compromise due to SAM. The patient was discharged from the intensive care unit at Day 13, and after 3 days at the coronary care unit, she was discharged to ambulatory follow-up with no sequelae. DISCUSSION: Veno-arterial extracorporeal membrane oxygenation restored haemodynamic stability in this patient with dynamic severe LVOT obstruction following cardiac arrest.

FREE ARTICLE

10. Eur Heart J Case Rep. 2018 Nov 26;2(4):yty128. doi: 10.1093/ehjcr/yty128. eCollection 2018 Dec.

Carotid sinus syndrome: a case report of an unusual presentation of cardiac arrest while diving.

Hartig F(1), Köhler A(1), Stühlinger M(1).

Abstract

BACKGROUND: Carotid sinus syndrome (CSS) is an exaggerated response to carotid sinus baroreceptor stimulation, which may result in hypotension, prolonged asystole, and subsequently transient loss of consciousness due to cerebral hypoperfusion. However, this commonly benign syndrome may have lethal consequences under certain circumstances such as scuba diving. **CASE SUMMARY:** We report the case of a trained 73-year-old male diver, who survived an almost fatal diving accident without any neurological deficits due to cardiac arrest under water. After recovery and intensive diagnostics in the local hospital, the origin of cardiac arrest remained unclear. However, after referral to our tertiary care centre CSS could be diagnosed by provoking syncope and asystole with carotid sinus massage (CSM). Consequently, a leadless pacing system was implanted and his medical diving fitness could then be recertified. **DISCUSSION:** In conclusion, CSS may be an underdiagnosed cause of loss of consciousness. Thus, screening for CSS by CSM should be included in medical exams in senior athletes and specifically in senior divers.

FREE ARTICLE

11. Front Pediatr. 2019 Apr 4;7:116. doi: 10.3389/fped.2019.00116. eCollection 2019.

Massive Amniotic Fluid Aspiration in a Case of Sudden Neonatal Death With Severe Hypoplasia of the Retrotrapezoid/Parafacial Respiratory Group.

Lavezzi AM(1), Poloniato A(2), Rovelli R(2), Lorioli L(2), Iasi GA(3), Pusiol T(4), Barera G(2), Ferrero S(1)(5).

Abstract

We report a case of a baby, who, after pregnancy complicated by maternal Addison's disease and Hashimoto's thyroiditis and natural delivery, unexpectedly presented a cardiorespiratory collapse and died 1 hour after birth without responding to prolonged neonatal resuscitation maneuvers. The cause of death was reliably established by carrying out a forensic postmortem examination. More specifically, the histological examination of the lungs showed the presence of abundant endoalveolar and endobronchial cornea scales caused by absorption of amniotic fluid. The neuropathological examination of the brainstem highlighted severe hypodevelopment of the retrotrapezoid/parafacial respiratory group, which is a complex of neurons located in the caudal pons that is involved in respiratory rhythm coordination, especially expiration, in conditions of enhanced respiratory drive, as well as in chemoreception. This neuropathological finding shed new light on the mechanisms underlying the massive amniotic fluid aspiration which led to this early death.

FREE ARTICLE

12. J Extra Corpor Technol. 2019 Mar;51(1):9-11.

Massive Air Embolism Caused by a Central Venous Catheter During Extracorporeal Membrane Oxygenation.

Kumar A(1), Keshavamurthy S(1), Abraham JG(1), Toyoda Y(1).

Abstract

Extracorporeal membrane oxygenation (ECMO) has become an integral treatment option for patients as a bridge to transplant, management of post cardiectomy cardiogenic shock, and for rescue after cardiopulmonary arrest. Significant strides in ECMO technology and management cannot, however, replace the importance of maintaining and following a comprehensive safety checklist. We herein report a case of massive air entrainment from an inadvertently disconnected port of a central venous catheter (CVC) in the neck which culminated in an airlock of the ECMO circuit. Ascertaining the relative position of the tip of the CVC with respect to the venous cannula on chest X-ray, tightly securing all its ports, and appraising and educating the health-care team can prevent this rare but devastating complication of fatal air embolism.

13. Neurocase. 2019 Apr 25:1-5. doi: 10.1080/13554794.2019.1608263. [Epub ahead of print]

Acute loss of psychic self-activation after cardiac arrest and delayed bilateral pallidal lesions on brain MRI.

Martinaud O(1)(2), Le Goff F(1), Carlier J(1), Pouliquen D(1), Gérardin E(3), Savouré A(4).

Abstract

The delay between cardiac arrest and brain MRI is usually extremely different in the few cerebral imaging studies assessing the affected brain areas. We report an unusual case of loss of psychic self-activation appeared immediately after a cardiac arrest in a middle age patient. The first brain MRI, one month after the vascular event, did not show the classical lesions typically reported, such as lesion of the caudate nucleus or the globus pallidus. Two years later, although the cognitive performances of our patient were improved, a second brain MRI demonstrated bilateral pallidal lesions, suggesting a possible mechanism with delayed hypoxic lesions.