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"Cardiocerebral or Cardiopulmonary Resuscitation: A Time for Reappraisal"

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Cardiocerebral Resuscitation Improves Survival of Patients with Out-of-Hospital Cardiac Arrest

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Aim of this Study

The purpose of this study was to demonstrate that changes in the current American Heart Association (AHA) and European Resuscitation Council (ERC) cardiopulmonary resuscitation (CPR) guidelines are needed to improve patient outcomes for victims of out-of-hospital cardiac arrest. The second aim of the study was to re-emphasize the concept of cardiocerebral resuscitation (CCR) techniques implemented in two rural counties of Wisconsin, United States and compare these techniques and their results with previously published guidelines.

Methods

All adult victims of out-of-hospital cardiac arrest were eligible to be included in the CCR protocol. The protocol was reviewed and approved by the investigational Board of Mercy Health System and the Wisconsin Emergency Medical Services Bureau, the project was instituted in Rock and Walworth counties. The CCR protocol was compared to standard CPR and advance life-support algorithms as described by AHA and ERC. The project's algorithm consisted of 200 chest compressions without ventilation prior to initial rhythm analysis. If a shockable rhythm was detected, only one shock was administered at maximum energy for the rhythm. Should there be no return of spontaneous circulation (ROSC), compressions continued at a rate of 100 per minute, which was monitorized by the use of a metronome. In those cases where only a responder equipped with an automatic external defibrillator (AED) was available, its pads will be placed before the compressions would start. Pulse rate was checked by the carotid location. Airway management was delayed until a second rescuer arrived. In those cases where the cardiac arrest was witnessed and the down time was less than 12 minutes, ventilation was postponed until spontaneous circulation returned or after finishing 3 cycles of compressions with rhythm analysis. Data was collected retrospectively for cases during 2001-2003, cases were treated with standard CPR protocol and in 2004-2005 prospective data was collected using this new protocol.

Results

During the 3-year period used as a control, utilizing standard CPR, a 20% of patients with witnessed cardiac arrest and shockable rhythms, survived to hospital discharge. Of them, 15% were neurologically intact. This was in comparison to the CCR protocol time period, where 57% of the cardiac arrest victims survived with 48% of them neurologically intact (p=0.001).

Among the survivors, shocks were delivered within

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7 minutes of call-to-shock time in 87% of control patients; by 10 minutes, all of the patients who survived had been shocked. For those patients receiving CCR at 7 minutes only 47% have been shocked. And at 10 minutes an 84% of patients who survived with CCR protocol, had been shocked. At 4 minutes of call-to-shock time 12% of control patients had already received the first shock, in contrast to a 9% in the CCR patients.

Conclusion

The authors conclude that the use of CCR for out-of-hospital cardiac arrest improves survival in out of the hospital witnessed cardiac arrest as long as the arrest was witnessed, and a present shockable rhythm.

Commentary

The AHA and ERC have been constantly making modifications to previously published CPR guidelines in an attempt to improve the outcome of victims of cardiac arrest. Despite many modifications, sudden cardiac death remains a leading cause of death among adults [1].

Currently survival rates from out-of-hospital cardiac arrest have been reported to be between 0-30% depending of the location, emergency response system, among others [2]. The article by Kellum and associates is interesting as it presents conflicting data to that previously reported. The survival rates reported by Kellum and coworkers are substantially higher than those previously reported [3,4,5]. The authors state that the reasons as to why their CCR protocol is more successful is due to the fact that current guidelines "tell the rescuer" to interrupt chest compressions in order to ventilate. Up until recently, the AHA and ERC guidelines required that the respirations should begin by delivering two rescue breaths and after that start with compressions [6]. In the new protocol the authors' proposal is to use 200 consecutive chest compressions and postpone ventilation. The AHA in its recent ACLS guidelines indicates that "Laypersons should be encouraged to do compression-only CPR if they are unable or unwilling to provide rescue breaths (Class IIa), although the best method of CPR is compressions coordinated with ventilations" [6].

In prior studies, the time allocated to ventilation has been analyzed. Kern and associates, estimated 16 seconds as the time it takes to stop compressions and restart them after mouth-to-mouth ventilation occurs. Based on this data the interruption of circulation would take nearly 60% of the resuscitation time [7].

While in-hospital cardiac arrest remains a common occurrence, situations in which there is no ventilation do not occur, as synchronized rescue breathing and compressions are routinely used. Data from experimental studies have shown that even during chest compressions without ventilation, the change in intrathoracic pressures as the result of the compression is enough to generate tidal ventilation [8]. Indeed, in some European countries, respirations are secondary and emphasis is mostly on chest compressions.

Another benefit of not interrupting compressions is an improvement of arterial pH. Weil and associates have shown that cardiac compressions are useful at any point during an arrest by preventing acidosis [9]. One of the primary endpoints of CPR is to continue blood flow to key organs in an attempt to prevent intracellular acidosis and cell death [10].

The study by Kellum and associates is important not only because of the outcome data, but the authors suggest revisions to the AHA's "chain of survival" CPR. In our experience, CCR in out-of-hospital cardiac arrests is a reasonable alternative. Programs aimed at re-educating CPR providers in this modified algorithm are needed.

Conclusion

Despite maximal improvements in medical therapy, cardiac arrest continues to be a leading cause of death. Techniques designed to improve blood flow and improve survival continue to be developed. CCR is a good alternative. CPR protocols and guidelines need to be continuously revised and the results of this clinical study validated in other large multi-center trials.

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