Cardiac arrest—guideline changes urgently needed

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Cardiopulmonary resuscitation is traditionally defined as chest compression and ventilation. The need for chest compressions is unquestionable, but the need or advisability of intermittent ventilation for out-of-hospital non-respiratory primary cardiac arrest has been very controversial.[1] The article by the SOS-KANTO study group in today's Lancet is of the utmost importance because it provides evidence in human beings that chest compression without ventilation is preferable for out-of-hospital cardiac arrest. This finding is an important piece of evidence that should lead to a prompt interim revision of the guidelines for out-of-hospital cardiac arrest.[2-4] Eliminating the need for mouth-to-mouth ventilation will dramatically increase the occurrence of bystander-initiated resuscitation efforts and will increase survival.

A major problem with most studies of out-of-hospital cardiac arrest is that most patients studied have absolutely no chance of surviving. Therefore a better approach to resuscitation is almost impossible to show. Nevertheless, many studies have identified a subgroup of patients with the greatest chance for survival: those who have a witnessed cardiac arrest and a shockable rhythm when the emergency team arrives. Within this important subgroup in the SOS-KANTO study, 22% of those who received bystander-initiated chest-compression alone had a favourable neurological outcome, as compared to 10% of those who received 2000 AHA and ILCOR guideline-recommended chest compressions and mouth-to-mouth breathing.[2]

From their inception, the standards and guidelines[3,4] for a bystander's response to out-of-hospital cardiac arrest have always emphasised the imperative of mouth-to-mouth ventilation, paradoxically called “rescue breathing.” While mouth-to-mouth ventilation may “rescue” an individual with respiratory arrest, this approach actually decreases the likelihood of a “rescue” in a much larger group of patients—those with a primary cardiac arrest.[1]

Mouth-to-mouth ventilation for primary cardiac arrest is detrimental for several reasons. First, this requirement greatly decreases bystander-initiated resuscitation efforts, an important determinant of survival from out-of-hospital cardiac arrest.1 Second, studies have long reported that survival is better in individuals with cardiac arrest who receive chest compression only than it is in those in whom no bystander rescue efforts were started until the actual or simulated arrival of emergency personnel.5-7 Third, mouth-to mouth ventilations by single bystanders requires inordinately long interruptions of essential chest compressions (figure).8 Fourth, during cardiac arrest, mouth-to-mouth or positive-pressure ventilation increases intrathoracic pressures, thereby reducing venous return to the chest. Therefore positive-pressure ventilation reduces the already marginal coronary and cerebral blood flow during cardiac arrest and resuscitation.9,10 This situation is made worse when forceful ventilation is given while the chest is being compressed.10 Fifth, with sudden unexpected primary cardiac arrest, ventilations are initially neither necessary nor logical, for with the onset of ventricular-fibrillation-induced arrest, the pulmonary veins, the left heart, and the entire arterial system are filled with oxygenated blood and the recommended ventilations do not increase arterial saturation—they only further delay the onset of critical chest compressions.1,11 Sixth, mouth-to-mouth ventilation is not necessary in a significant number of victims of witnessed cardiac arrest because they initially gasp, and if chest compressions are started early and continued, many of these patients will continue to gasp and thereby provide physiological ventilation (eg, that with decreasing intrathoracic pressures that facilitates venous return to the chest).12-14 Seventh, survival from experimentally induced cardiac arrest is better with higher coronary perfusion pressures produced by forceful chest compressions.15,16 Eighth, in non-paralysed animals in cardiac arrest, survival is dramatically better with chest-compression-only resuscitation than with ventilations plus chest compressions, when chest compressions were interrupted for a realistic 16 s to provide the two mouth-to-mouth breaths between each set of 15 chest compressions (figure).17 The SOS KANTO study has now shown this result in human beings.2

Aortic and right atrial pressures during chest compressions in anaesthetised swine model of cardiac arrest due to ventricular fibrillation

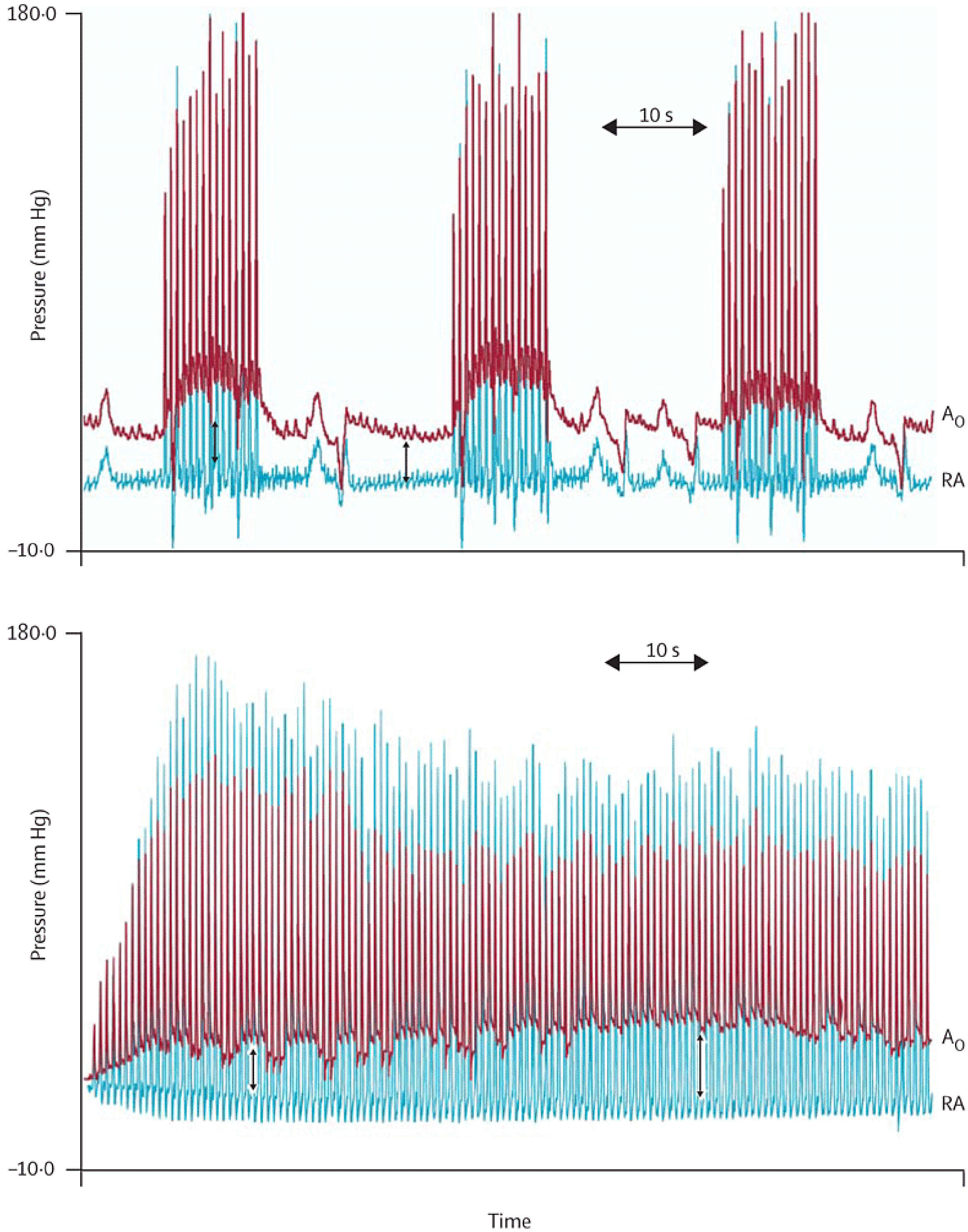

Figure. Aortic and right atrial pressures during chest compressions in anaesthetised swine model of cardiac arrest due to ventricular fibrillation

Coronary perfusion pressure (arrows)=difference between aortic (Ao, red) diastolic and right atrial (RA, blue) pressures. Cerebral perfusion pressure is difference between carotid systolic pressure and intracerebral venous pressure generated by each chest compression. Cerebral blood flow occurs because of closure of venous valves or collapse of veins at thoracic outlet with each chest compression, which results in positive pressure gradient across brain. Top: each 15 chest compressions are interrupted for about 16 s to simulate duration of interrupted chest compressions required for single bystander to deliver two mouth-to-mouth ventilations and return to chest compressions. Bottom: uninterrupted compressions, note arterial pressures are continuous, resulting in near continuous cerebral perfusion.

We have recommended cardiopulmonary resuscitation by bystander chest-compression-only for out-of-hospital cardiac arrest for years.18 More recently this approach has been incorporated into Cardiocerebral Resuscitation, a new approach to resuscitation of victims of cardiac arrest that eliminates early positive-pressure ventilation by emergency personnel, emphasises continuous chest compressions and improves survival.1,19

A major flaw with the current, and all previous, guidelines for cardiac arrest is that they recommend the same approach of cardiopulmonary resuscitation for two entirely different clinical conditions: primary cardiac arrest where the arterial blood is well oxygenated at the time of the cardiac arrest, and respiratory arrest when the arterial blood is so severely desaturated that it contributes to hypotension and secondary cardiac arrest. We should continue, for now, to follow the newer guidelines of assisted ventilations and chest compressions for respiratory arrest (such as in drowning or drug overdose), but the guidelines should promptly be changed to chest-compression-alone for witnessed unexpected sudden collapse (a condition that is, in all probability, cardiac arrest).3,4

The critically important findings by the SOS-KANTO group should lead to changes in guidelines. Advocating, encouraging, and teaching chest-compression-only for witnessed unexpected sudden collapse will dramatically increase bystander-initiated resuscitation efforts and thereby give these patients a better chance of survival when emergency personnel arrive. We should continue instructions in cardiopulmonary resuscitation for the equally important, but less frequent, occurrences of drowning and other forms of respiratory arrest.

I declare that I have no conflict of interest.

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