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Editorials

Cardiopulmonary resuscitation for out of hospital cardiac arrest

American Heart Association advocates chest compression without ventilation

Is ventilation of the lungs necessary when starting cardiopulmonary resuscitation (CPR) for out of hospital cardiac arrest? Increasing evidence shows that it has no effect on outcome and may even make matters worse. The American Heart Association has responded to this controversy by publishing a statement "Hands-only (compression-only) CPR: a call to action for bystander response to adults who experience out-of-hospital sudden cardiac arrest."[1] The main message of this statement is that by encouraging bystanders to provide at least chest compressions, the odds of survival from out of hospital cardiac arrest will be improved.

Several animal studies show no survival benefit with the addition of ventilation during cardiopulmonary resuscitation.[1] A limitation of these studies, however, is that the airways of the animals are generally patent, which may enable chest compressions alone to generate some ventilation, particularly if gasping also occurs during chest compressions. Unconscious supine humans usually have an obstructed airway, and gasping occurs less often than in the animal models. In a recent Japanese study, only 7.1% of patients with out of hospital cardiac arrest were gasping when ambulance personnel arrived on the scene.[2] Severe hypoxaemia developed rapidly in a compression-only cardiopulmonary resuscitation animal model with an obstructed airway.[3]

Surveys indicate that bystanders and medical professionals are reluctant to do mouth to mouth ventilation (rescue breathing), partly because of fears of infection, but also because it is considered unpleasant.[4 5 6] Contrary to these findings, lay people trained in basic life support, who were interviewed after witnessing cardiac arrests but who did not perform bystander cardiopulmonary resuscitation, indicated that this was mainly because of panic; only four out of 279 (1.4%) of them said that it was because they objected to doing mouth to mouth ventilation.[7] Compression-only cardiopulmonary resuscitation is easier to learn than conventional resuscitation.[8] Lay people cannot follow telephone instructions from ambulance dispatchers to give mouth to mouth ventilation and chest compressions while waiting for an ambulance to arrive. In a study of dispatch assisted (telephone) cardiopulmonary resuscitation, instructions were more likely to be followed when the ventilation component was omitted, and survival was similar in the compression-only group.[9]

Several observational studies show similar survival rates when bystanders use compression-only cardiopulmonary resuscitation or conventional resuscitation.[1] Most importantly, all these studies show that any method of cardiopulmonary resuscitation increases survival compared with no resuscitation. Although compression-only cardiopulmonary resuscitation is not associated with statistically better survival overall compared with conventional cardiopulmonary resuscitation, one of these studies reported that outcome was significantly better for the compression-only group when response times were short.[2] When the time from collapse to first attempt at resuscitation by a bystander was four minutes or less, a favourable neurological outcome was achieved in 10% (23/227) of the compression-only group compared with 5% (18/351) of the conventional cardiopulmonary resuscitation group (odds ratio 2.1, 95% confidence interval 1.1 to 4.0). The most recent studies have been accompanied by a plea for an urgent change in cardiopulmonary resuscitation guidelines.[10]

Should we teach lay people to perform compression-only cardiopulmonary resuscitation? In the United Kingdom each year, bystander cardiopulmonary resuscitation occurs in a third of the roughly 30 000 ambulance treated cardiac arrests (figures based on unpublished Ambulance Service Association and Joint Royal Colleges Ambulance Liaison Committee data). The logic behind promoting compression-only cardiopulmonary resuscitation is that it increases the frequency of bystander cardiopulmonary resuscitation, and that any bystander cardiopulmonary resuscitation will increase the chance

of long term survival compared with no resuscitation. This should benefit victims of out of hospital cardiac arrest from a cardiac cause when ambulance response times are short. Most (65-80%) out of hospital treated cardiac arrests have a primary cardiac cause.[2 11] The potential losers of a compression-only cardiopulmonary resuscitation approach are people who are likely to benefit from both ventilation and compressions, such as people having arrests that are associated with drowning, trauma, or airway obstruction; those having primary respiratory arrest or prolonged cardiac arrest; and children having cardiac arrests. People who favour compression-only resuscitation argue that these groupshave a low survival rate even with conventional cardiopulmonary resuscitation, and a change to compression-only cardiopulmonary resuscitation will have an overall benefit by increasing the number of survivors from primary cardiac arrest.

The American Heart Association statement indicates that compression-only cardiopulmonary resuscitation does not apply to unwitnessed cardiac arrest, cardiac arrest in children, or cardiac arrest presumed to have a non-cardiac cause. This implies that lay people must be able to differentiate a primary cardiac arrest from cardiac arrest from a non-cardiac cause and would need to be trained in conventional cardiopulmonary resuscitation as well as compression-only resuscitation. We do not know whether lay people can distinguish between primary cardiac arrest and primary respiratory arrest. If guidelines for lay people are changed to compression-only cardiopulmonary resuscitation for witnessed sudden collapse, should we continue to teach mouth to mouth ventilation for primary respiratory arrest?

The evidence for and against the use of compression-only cardiopulmonary resuscitation instead of conventional resuscitation (30 compressions and two ventilations, repeated until help arrives) is being fully evaluated, along with a wide range of other resuscitation topics, in preparation for the 2010 Consensus Conference on Cardiopulmonary Resuscitation Science. After this conference, international resuscitation guidelines will be revised and implemented.

For the time being, in line with the current European and UK guidelines,[12] lay rescuers who are not trained in cardiopulmonary resuscitation, or those not willing or unable to give effective mouth to mouth ventilations, should give compression-only cardiopulmonary resuscitation at a rate of 100/minute. Those rescuers who are trained in conventional cardiopulmonary resuscitation should ensure that ventilations and any other interventions cause only minimal interruption of chest compressions.

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Competing interests: JS is vice chairman of the Resuscitation Council UK and a co-chair of the education, implementation, and teams task force of the International Liaison Committee on Resuscitation (ILCOR). JPN is chairman of the Resuscitation Council UK and co-chair of ILCOR. Both authors are editors of the journal *Resuscitation*.

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