References


eComment: Avoiding the adverse consequences of external cardiac massage during in-hospital resuscitation after cardiac surgery

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Lockowandt and colleagues [1] published results from their ‘best evidence’ search, which addressed whether it is acceptable to delay cardiopulmonary resuscitation (CPR) if a patient arrests after cardiac surgery in order to attempt defibrillation or pacing prior to performing external cardiac massage (ECM). They recommended that guidelines for immediate ECM prior to defibrillation in-hospital should be followed as the evidence that significant trauma to the myocardium due to ECM has been reported in cardiac surgery patients is not yet strong enough to recommend a change in practice. The adverse consequences caused by ECM, however, can be avoided by using alternative CPR methods.

The likelihood of achieving return of spontaneous circulation (ROSC) and surviving a cardiac arrest has been linked to the ability to achieve and maintain coronary perfusion pressure (CPP) adequately above a threshold level of 15 mmHg prior to defibrillation [2]. One can argue that failure to achieve ROSC despite prompt defibrillation is possible in many post-cardiac-surgery patients due to some level of impaired left ventricular diastolic filling, which likely more rapidly decreases CPP to below threshold levels. Therefore, to avoid unnecessary defibrillation, which can increase the already existing myocardial dysfunction, and to avoid the potential adverse consequences of ECM and the subsequent need for sternal rewiring, two alternative methods of CPR [3] can be utilized to maintain adequate CPP before defibrillation.

First, minimally invasive direct cardiac massage (or MID-CM) is a technique that uses a commercially available hand-held device (TheraCardia, Inc) that is introduced through a small thoracotomy to manually achieve direct cardiac compression with a 4-cm up-and-down stroke at a rate of 80–100 compression-decompressions per min. It has been pointed out that a human pre-hospital pilot study of 25 patients concluded that MID-CM produces greater blood flow than conventional CPR.

Second, abdominal compressions-only CPR (or ACO-CPR) (with an open airway possibly maintained by head rotation during single-rescuer CPR [4] or by manual airway maneuvers during two-rescuer CPR) is a new resuscitation method that can be applied immediately to circulate oxygenated blood to the heart and brain, which may improve the chances of successful pacing or defibrillation on the first attempt, in patients suffering an arrest after cardiac surgery. High-frequency compressions of the abdominal aorta (due to rhythmic compression by compressing the mid-abdomen) produce resonant pressure-volume waves within the aorta that drive blood flow. Because there is no direct pressure over the heart to empty the left ventricle with each compression during ACO-CPR and because left ventricular volume will increase as a result of flow from the higher-pressure pulmonary arteries to the lower-pressure left atrium and left ventricle, the heart acts as a conduit, thereby allowing significant increases in ventricular volume during ACO-CPR [5], which would compensate for the impaired left ventricular diastolic filling found in many post-cardiac-surgery patients. However, cardiac compressions with MID-CM may still be necessary because ACO-CPR engorges the heart with blood; a blood-engorged heart cannot be successfully defibrillated and circulation cannot return without first decompressing the heart with cardiac compressions [4, 5].

References

When due to tension pneumothorax, external massage may also not help and drainage is the treatment of choice.

When all this is added to the risk of damage to sternum, heart and suture lines, it makes a compelling case for delaying external massage by a few seconds if that allows the immediate administration of the treatment of choice (such as defibrillation or pacing) as there is every chance that these interventions may correct the problem thus avoiding the need for potentially damaging massage in the first place.

Reference


eComment: Also in cardiac arrest it is important to think first

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The question raised in the manuscript of Lockowandt and coworkers is a very important question [1]. In most cases patients after cardiac surgery will be monitored for at least 24 h. Because of this monitoring, if a patient arrests, it will be known if the arrest is due to, for instance, a severe bradycardia or a ventricular fibrillation. These causes can be treated very quickly in an intensive care unit. If pacing in the case of bradycardia or a few attempts of defibrillation in case of ventricular fibrillation are not successful, it is of utmost importance to start resuscitation and reopening of the chest as soon as possible [2]. Also a tension pneumothorax should be recognized in a few seconds in the intensive care unit. Drainage in that case is more successful than external massage. If the patient arrests a few days after cardiac surgery he will be on the ward and probably there will be more delay until it is clear what the arrest is due to. In those cases the nursing staff should start resuscitation while waiting for the doctors on call to arrive.

The resuscitation technique itself needs a warning notice. In our hospital we have seen several patients after an out of hospital resuscitation where a mechanical device had been used for the external cardiac massage. Sternal fractures were not uncommon just as damage to the myocardium and we have even seen esophageal ruptures in patients where the mechanical device was not perfectly adjusted to the patient’s body size. The use of these devices in patients with a recently divided sternum will, without any doubt, lead to a number of sternal fragments unsuitable for sternal rewiring and damage to the underlying structures.

References


eComment: The sooner the beginning of cardiopulmonary resuscitation, the better the outcome for the arrested cardiac operated patient

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The two questions posed by your article [1] are of great importance as they concern every surgeon.

Concerning the first question, the immediate cardiopulmonary resuscitation (CPR) is not only necessary but also mandatory. We strongly believe that CPA should start as soon as possible. Independently of the availability for defibrillation or pacing. We consider maintaining of an adequate blood flow and pressure for vital organs (brain and myocardium), before every...