Impedance Threshold Devices for CPR

CPR is intended to restore spontaneous circulation by providing blood flow to the heart and brain. Coronary perfusion pressure (CPP) is determined by the difference between aortic diastolic pressure and right atrial pressure (RAP). Interventions to maximize perfusion should increase aortic pressure and minimize increases in RAP. CPP is the difference between mean arterial pressure (MAP) and intracranial pressure (ICP); interventions to improve CPP should target MAP increase and ICP decrease. During conventional CPR, chest compression and ventilation contribute to abnormally high intrathoracic pressure (ITTP), restricting venous return, and increasing RAP from transmural transmission of ITTP to the atrium. Lowering ITTP decreases RAP and ICP and can increase cerebral and CPPs.

The impedance threshold device (ITD) can be attached between the endotracheal tube and breathing circuit, preventing air inflow via the endotracheal tube during chest recoil until cracking pressure is reached (usually 12 cm H2O). ITD use can attenuate some negative consequences of CPR. Eight dogs were anesthetized and, following euthanasia (as part of an unassociated terminal study), standard CPR was performed with some dogs having an ITD in place. Dogs in the ITD group had increased carotid blood flow and CPP and decreased right atrial diastolic pressure. There was no difference in end-tidal CO2, diastolic arterial blood pressure (BP), mean BP, or systolic BP. ITD use resulted in favorable hemodynamic results and warrants clinical investigation.

Commentary

An ITD, a simple and inexpensive device, reduces intrathoracic pressure during ventilation and chest compression, theoretically improving hemodynamics. This study showed improvement in specific hemodynamic parameters, despite limited sample size and model (ie, anesthetic overdose). Other models in veterinary medicine1 and a human trial of ITDs2 have shown no benefit. Success rates of CPR in human and veterinary medicine remain poor. Anything (especially something simple and inexpensive) that can improve outcomes is welcome, but it is premature to determine whether an ITD offers significant benefit to outcome or survival.—Franciszek von Esse, VMD, DABVP

Source

