CCSV - a new ventilation mode during CPR

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In literature many ways to oxygenate and ventilate in resuscitation were studied, but still the best could not be found (1). Fact is that ventilation with common frequency will be interrupted multiple times by chest compression which counteracts the trial to reestablish circulation and oxygenation. (pict1)

(pict1) pressure- and flow-curve during CPR with IPPV

In 2011 Chest Compression Synchronized Ventilation (CCSV) a novel ventilation mode for resuscitation was developed by WEINMANN Emergency: Each chest compression rapidly triggered a pressure controlled breath.

Studies in a pig model (2) could show the positive effect of synchronizing chest compression with ventilation: The animals had higher arterial blood pressure, better oxygenation and better carbondioxide elimination during resuscitation compared to a control group with intermittent positive-pressure ventilation (IPPV) and BiLevel. The higher cardiac output occurs by a rapid increase of intrathoracic pressure during compression phase, and by the lack of intrathoracic pressure during decompression reduction of pressure in the lungs results in not hindering the venous blood return flow.

In November 2017 a patient observation study started at several emergency medicine departments in Europe.

The first CPR with CCSV took place in Oberwart, a little town in the east of Austria.

A Patient with witnessed cardiac arrest received bystander CPR. 8 minutes after the collapse the ems team arrived at the scene. In minute 14 CCSV ventilation was established (Medumat Standard2 Weinmann Emergency, Germany), 2 minutes later the mechanical chest compression device (Corpuls CPR Stemple, Germany) was prepared. Results were measured by a monitoring system device (Corpuls C3 Stemple, Germany) $SO_2 = 100\%$, $etCO_2 = 40$ (30 - 50) mmHg. (pict2) 50 minutes after collapse the death had to be testified.

The first data from the observation study are very hopeful! But only clinical studies can give answer if this new ventilation mode can improve hemodynamical and respiratory parameters during cardio pulmonary resuscitation.

Literature:

- (1) Cordoli J Appl Physiol 2016: Impact of ventilation strategies during chest compression
- (2) Kill Crit Care Med 2013: Mechanical ventilation during CPR with IPPV, Bilevel and CCSV in a Pig Model

(pict2) pressure- and flow-curve during CPR with CCSV