Mechanical positive pressure ventilation during resuscitation in out-of-hospital cardiac arrest with Chest Compression Synchronized Ventilation (CCSV)

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Purpose of the study

The ILCOR-Guidelines recommend ventilation with pure oxygen and Intermittent Positive Pressure Ventilation with a fixed respiration rate of 10/min during Advanced Life Support (ALS)[1]. Meanwhile there is a novel resuscitation ventilation mode named Chest Compression Synchronized Ventilation (CCSV) available[2]. We report data of first cases of resuscitation with CCSV in out-of-hospital cardiac arrest (OHCA).

Materials and methods

In an urban physician staffed Emergency Medical Service ventilation with CCSV following endotracheal intubation was added to standard ALS-algorithms. CCSV is designed as a pressure-controlled and with each chest compression synchronized breathing pattern (FiO₂ 1.0, P_{insp}=60mbar, inspiratory time 205ms), insufflating a very short oxygen flow in time with the start of each chest compression. We retrospectively evaluated all cases of OHCA with use of CCSV and measured time of mechanical ventilation with both manual and mechanical chest compression (CC) (median, 25%/75%percentiles), number of patients admitted to hospital with return of spontaneous circulation (ROSC), 24h-survival and discharged alive.

Fig.2: Characteristic pressure/time and flow/time curves of Chest Compression Synchronized Ventilation

Fig.1: Chest Compression Synchronized Ventilation in out-of-hospital cardiac arrest on scene

Results

34 Patients with OHCA were ventilated with CCSV between July 2018 and March 2019. CCSV Ventilation time in total (n=34) 18:25(7:54/26:17)min; manual CC (n=16) 5:04(2:04/6:38)min, mechanical CC (n=29) 18:26(7:23/26:42)min. Admission with ROSC n=21(61.8%), 24h survival n=12(35.3%), discharged alive n=5(14.7%). Total CCSV-Ventilation times in patients discharged alive were 4:48, 8:42, 25:00, 30:18 and 40:24min. No serious adverse events by CCSV were reported.

Conclusions

This is the first reported case series of Chest Compression Synchronized Ventilation (CCSV) in OHCA. The rates of ROSC in admission and outcome are promising high with a maximum time of ventilation during chest compression of more than 40 minutes. Therefore we need further data to evaluate the potential of CCSV.

References

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