Evaluation of clinical efficacy and safety of a newly developed automated cardiopulmonary resuscitation device; a porcine cardiac arrest model

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Background

- Various automated compression device (ACD) have been adopted by emergency medical services (EMS) worldwide to ensure cardiopulmonary resuscitation (CPR) quality
- We developed a new ACD with a manual adjustment function according to compression depth and rate
- This study aimed to compare the CPR quality and chest injury between the new ACD and a conventional device (LUCAS, Physio-Control, Sweden)

Methods

- A Randomized Experimental Trial using each pigs for ACD and LUCAS group were performed to compare the CPR quality, outcomes and safety
- After 1-minute of untreated electrical-induced ventricular fibrillation, followed by 8-minutes of basic life support, and 20-minutes of advanced cardiac life support including epinephrine infusion were provided under mechanical ventilation

- Hemodynamic parameters were obtained and observed end-tidal CO₂ (ETCO₂) were continuously measured from endotracheal tube as study outcome
- Mixed model analysis and repeated measure ANOVA were used to compare the difference of hemodynamic parameters and observed ETCO₂
- We examined all pigs for gross pathologic findings (number of lung contusion, cardiac contusion and tamponade) after CPR procedures through open thoracotomy
- Scoring: (1,2,3) for hemorrhage up to (1,2,3)/3 of surface of each lung lobe, 4 for cardiac contusion or tamponade

Conclusion

- Hemodynamic parameters and observed ETCO₂ were slightly better in LUCAS group than new ACD group, but the statistical significances were not found in the porcine experimental mechanical models

Results

- There was no significant difference for hemodynamic parameters

hemodynamic parameter	LUCAS		New ACD		p-value
	mean	median(q1-q3)	mean	median(q1-q3)	
SBP	73.96	73(57.3-90.5)	81.98	78.96(59-99.11)	0.39
DBP	23.49	23(12-33.02)	13.18	12(7-18.84)	0.26
MAP	35.27	36(23-45)	29.39	30(17-39)	0.71
CBF	66.90	65.73(42.5-82)	73.58	63.58(42.04-101.8)	0.56
RAP	32.01	30.8(23.99-38.59)	38.92	31.64(20.44-56)	0.61
COPP	18.78	18.3(13.82-22.22)	15.87	15.14(12.42-18.48)	0.41
ETCO ₂	26.75	26(22.16-31.6)	19.07	18(11.35-26)	0.24

- Repeated measure ANOVA for observed ETCO₂ did not show significant difference

- Model 1: All pigs during BLS phase

Model 2: sensitivity analysis for non-ROSC group

- Study subjects recovered from arrest: **new ACD 5/8 vs. LUCAS 5/8**

- BLS survival: 5 in new ACD group / 2 in LUCAS group

- The gross pathologic findings through open thoracotomy examination after CPR showed insignificant difference of injury grade in chest cavity and wall