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Letter to the Editor

In a pediatric animal model of cardiac arrest: Is diastolic blood pressure associated with survival during resuscitation?



To the Editor,

We have read with interest the recent article by O'Brien et al. entitled, "Association of diastolic blood pressure with survival during paediatric cardiopulmonary resuscitation".¹ In this study the authors made a secondary analysis in a neonatal-infant animal model of asphyxial cardiac arrest (CA) using a large sample size (200 resuscitations). They found that survival is associated with higher diastolic blood pressure (DBP) during active cardiopulmonary resuscitation (CPR) but they did not report systolic and mean blood pressure (SBP, MBP) values during resuscitation.

We report a secondary analysis of different studies previously published^{2–4} with similar swine model, with a mean of 10.3 kg of weight. In 196 resuscitations, we found, as shown in Table 1, that DBP but also SBP and MBP were significantly higher in survivors than in non-survivors at 3 min after the beginning of CPR and before the first dose of adrenaline. This difference was getting smaller during

resuscitation, similarly occurred in O'Brien study. In our opinion, it could be due to the fact that most animals had recovered spontaneous circulation in the first minutes of resuscitation.

If DBP was a marker of higher survival, it would be encouraging for pediatric in-hospital cardiac arrest. O'Brien et al. hypothesized about using DBP to guide CPR, to prognosticate the likelihood of ROSC and modify the treatment. However, these authors did not report SBP and MBP values, therefore it is not possible to know if these parameters were also higher in the animals which achieved spontaneous circulation. A study published by Sutton et al. found that in an animal model, systolic blood pressure—targeted CPR improves 24-h survival compared with traditional CPR.⁵ According to our data SBP and MBP could be also useful and probably SBP is easier to measure.

On the other hand, blood pressure values could reflect not only the efficacy of CPR but spontaneous cardiac activity in animals that had

Table 1 – Blood pressure values at 3, 6 and 9 min after the beginning of cardiopulmonary resuscitation (CPR). Statistical test U-Mann Whitney was used.

CPR time	Blood pressure (mmHg)	Recovery of spontaneous circulation (ROSC)						p
		Non-ROSC (n = 135)			ROSC (n = 61)			
		N	Median	IQR	N	Median	IQR	
3 min	SBP	101	55	30	58	94	97	0.001
	DBP	101	13	11	57	34	38	0.001
	MBP	135	21	14	61	46	64	0.001
6 min	SBP	116	54	34	17	86	72	0.006
	DBP	114	11	12	16	33	51	0.001
	MBP	127	20	14	18	38	47	0.001
9 min	SBP	99	49	32	5	59	65	0.147
	DBP	97	10	9	5	25	15	0.002
	MBP	124	20	11	5	37	19	0.002
12 min	SBP	111	51	34	2	55	10	0.774
	DBP	110	10	9	2	18	1	0.082
	MBP	125	20	11	2	31	6	0.052

IQR: interquartile range; SBP: systolic blood pressure; DBP: diastolic blood pressure; MBP: mean blood pressure.

recovered spontaneous circulation. Furthermore, although the authors measured BP values every 30 s and excluded values of 30 s before reaching ROSC, they did not specify if they interrupted every 30 s chest compressions to check ROSC or how they determined the exact moment of ROSC. For these reasons, we believe that these results should be taken cautiously, as it is difficult to know if the increase in blood pressure is the cause or the consequence of the recovery of spontaneous circulation. Studies in children are necessary to analyse the value of DBP, MBP and SBP during chest compression to predict survival.

Conflicts of interest

None of the author of this manuscript have any conflicts of interest.

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REFERENCES

- O'Brien CE, Santos PT, Reyes M, et al. Association of diastolic blood pressure with survival during paediatric cardiopulmonary resuscitation. *Resuscitation* 2019;1–7.
- González R, Pascual L, Sava A, Tolón S, Urbano J, López-Herce J. Ventilation during cardiopulmonary resuscitation in children: a survey on clinical practice. *World J Pediatr* 2017;13:544–50.
- López J, Fernández SN, González R, Solana MJ, Urbano J, López-Herce J. Different respiratory rates during resuscitation in a pediatric animal model of asphyxial cardiac arrest. *PLoS One* 2016;11:1–14.
- Manrique G, García M, Fernández SN, et al. Comparison between synchronized and non-synchronized ventilation and between guided and non-guided chest compressions during resuscitation in a pediatric

animal model after asphyxial cardiac arrest. *PLoS One* 2019;14:e0219660.

- Sutton RM, Friess SH, Naim MY, et al. Patient-centric blood pressure-targeted cardiopulmonary resuscitation improves survival from cardiac arrest. *Am J Respir Crit Care Med* 2014;190:1255–62.

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