Relationship of LOI and brain dysfunction after resuscitation in a porcine model of cardiac arrest

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Background

Lactate oxygen index (LOI) higher than 0.08 has been proposed as an early indicator of brain ischemia injuries. In the present study, we investigated the relationship between LOI and brain dysfunction after cardiopulmonary resuscitation (CPR) in a porcine model of cardiac arrest (CA) with different downtimes. We hypothesized that LOI closely correlates with brain dysfunction after resuscitation.

Methods

Ventricle fibrillation (VF) was electrically induced in 16 male domestic pigs weighing 40±2kg. They were randomized into untreated VF 5 min group (V5, n=8) or 10 min group (V10, n=8). All animals were successfully resuscitated. Blood gas samples were obtained from internal jugular venous and descending aorta at baseline (BL) and 120 min post resuscitation (PR). Neurological dysfunction score (NDS) was evaluated daily for a total of 96 hours. LOI was calculated based on the arterial (CaO_2) and jugular venous oxygen (CjO_2) content:

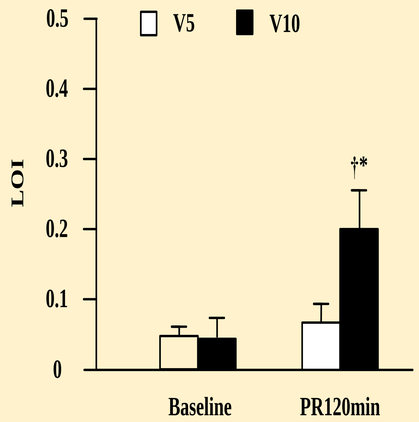
$CaO_2 = (1.34 \times Hb \times SaO_2) + (0.003 \times paO_2)$

$CjO_2 = (1.34 \times Hb \times SjO_2) + (0.003 \times pjO_2)$

LOI = -(arterial lactate-jugular vein lactate)/(CaO_2-CjO_2).

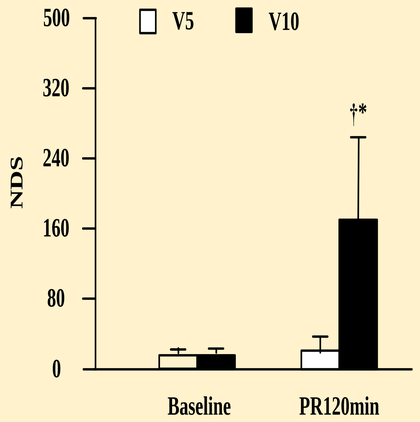
Results

Figure1. Lactate oxygen index after cardiopulmonary resuscitation



LOI, lactate oxygen index; V5, untreated ventricular fibrillation for 5 min; V10, untreated ventricular fibrillation for 10 min; PR, post resuscitation. *P<0.05 vs baseline; †P<0.05 vs V5.

Figure2. Neurological Dysfunction Score after cardiopulmonary resuscitation



NDS, Neurological Dysfunction Score; V5, untreated ventricular fibrillation for 5 min; V10, untreated ventricular fibrillation for 10 min; PR, post resuscitation. *P<0.05 vs baseline; †P<0.05 vs V5.

Results

LOI at PR 120 min increased in V10 animals but without changes in V5 group when compared with baseline [(0.20±0.07) vs. (0.04±0.02), p < 0.01; (0.07±0.03) vs. (0.05±0.01), p=0.45]. In comparison with V5 animals, higher LOI at PR 120 min and greater NDS at PR 96 hours were observed in V10 animals [(0.20±0.07) vs. (0.07±0.03); (170±125) vs. (23±15), all p<0.01]. Spearman rank correlation showed positive correlations between LOI at PR120 min and NDS at PR 96 hours (r=0.86, p<0.01).

Conclusions

LOI positively correlates with post-resuscitation neurological dysfunction and might serve as a promising indicator to predict cerebral outcome after CPR.

References

1. Metz C, et al. Journal of Cerebral Blood Flow and Metabolism.1998:332-343.