EARLY HYPEROXIA DOES NOT COMPROMISE THE LONG-TERM NEUROLOGICAL OUTCOME AFTER CARDIOPULMONARY RESUSCITATION

Humaloja J¹, Efendijev I², Folger D¹, Skrifvars MB^{2,4}, Pekkarinen PT², Raj R³, Litonius E²

1) Faculty of Medicine, University of Helsinki 2) University of Helsinki and Helsinki University Hospital, Division of Intensive Care Medicine, Department of Anaesthesiology, Intensive Care and Pain Medicine, Helsinki, Finland. 3) University of Helsinki and Helsinki University Hospital, Department of Neurosurgery, Helsinki, Finland 4) University of Helsinki and Helsinki University Hospital, Department of Emergency Care and Services, Helsinki, Finland.

Introduction

Numerous studies suggest hyperoxia increases short-term mortality after cardiopulmonary resuscitation (CPR), but data on long-term mortality and neurological outcome are scarce.

⁽¹⁻⁴⁾ We determined whether early hyperoxia after CPR is associated with long-term neurological outcome.

Methods

Data from adult cardiac arrest patients treated after CPR in Meilahti University hospital intensive care units between years 2005 and 2013 were analysed retrospectively. Initial arterial P_aO_2 was determined from the first arterial blood sample collected after resuscitation. Hyperoxia was defined $P_aO_2 > 16$ kPa and hypoxia $P_aO_2 < 8$ kPa. Other variables included in the analyses were age, vital signs, P_aCO_2 and pH, laboratory parameters (lactate, creatinine, Hb, plasma glucose), cardiac arrest location and initial rhythm. The primary outcome was Cerebral Performance Category 12 months after the resuscitation. We categorised scores 1 and 2 as “good neurological outcome” and 3 or greater as “poor neurological outcome”.

We performed univariate and multiple logistic regression to test associations between variables and the outcome.

The Results

Study population included 925 patients. According to univariate analysis hyperoxia was associated with lower risk of poor neurological outcome (odds ratio [OR] 0.61: 95% confidence interval [CI] 0.43-0.87, $p=0.006$) compared to normoxia. However, this association disappeared after the adjustment for confounding variables (OR 0.75: 95% CI 0.47-1.20), $p=0.23$). Additionally, there was a significant association between poor neurological outcome and higher age (OR 1.02: 95% CI 1.01-1.03), $p<0.001$) and higher lactate concentration (OR 1.09: 95% CI 1.04-1.14), $p<0.001$). Compared to ventricular fibrillation the risk of poor neurological outcome was higher for asystole (OR 2.32: 95% CI 1.40-3.85), $p=0.001$) and pulseless electrical activity (OR 1.81: 95% CI 1.22-2.66), $p=0.003$).

Conclusions

Our study showed no association between early

post-arrest hyperoxia and poor long-term neurological outcome. The impact of hyperoxia on patients neurological performance and cognitive skills in the long run needs further study.

References

- (1) Vaahersalo J, Bendel S, Reinikainen M, Kurola J, Tiainen M, Raj R, et al. Arterial blood gas tensions after resuscitation from out-of-hospital cardiac arrest: Associations with long-term neurologic outcome. *Crit Care Med* 2014;42(6):1463-1470.
- (2) Kilgannon JH, Jones AE, Parrillo JE, Dellinger RP, Milcarek B, Hunter K, et al. Relationship between supranormal oxygen tension and outcome after resuscitation from cardiac arrest. *Circulation* 2011;123(23):2717-2722.
- (3) Elmer J, Scutella M, Pullalarevu R, Wang B, Vaghasia N, Trzeciak S, et al. The association between hyperoxia and patient outcomes after cardiac arrest: analysis of a high-resolution database. *Intensive Care Med* 2015;41(1):49-57.
- (4) Roberts BW, Kilgannon JH, Chansky ME, Mittal N, Wooden J, Trzeciak S. Association between postresuscitation partial pressure of arterial carbon dioxide and neurological outcome in patients with post - Cardiac arrest syndrome. *Circulation* 2013;127(21):2107-2113.