

Abstract

Background: Tissue oxygenation index (TOI) using the near infrared spectroscopy (NIRS) has been demonstrated as a useful indicator to predict return of spontaneous circulation (ROSC) among out-of-hospital cardiac arrest (OHCA) patients in hospital setting. However, there is a dearth of related published studies based on pre-hospital setting.

Methods: In this prospective observational study, we measured TOI in pre-hospital setting among OHCA patients receiving cardio-pulmonary resuscitation (CPR) during ambulance transportation between 2017 and 2018. Throughout the pre-hospital CPR procedure, TOI was continuously measured. The study population was divided into two subgroups: ROSC group and non-ROSC group. **Results:** Of the 70 patients included in the final analysis, 23 achieved ROSC and 47 did not achieve ROSC. ROSC group was significantly younger and more likely to have their event witnessed and shockable rhythms and had higher Δ TOI (changes in TOI) (5.7% vs. 1.4%; $p < 0.01$) than patients in the non-ROSC group. In addition, ROSC group had stronger positive correlation between mean chest compression

(CC) rate and Δ TOI ($r = 0.80$, $p < 0.01$) than their counterpart non-ROSC group ($r = 0.57$, $p < 0.01$). OHCA patients whose Δ TOI was $\leq -2\%$ did not achieve ROSC, whereas OHCA patients whose Δ TOI was $\geq 8\%$ achieved ROSC.

Conclusions: This study demonstrated an association between higher Δ TOI and ROSC. CC rate also showed strong positive correlation with Δ TOI especially among ROSC group.

Key words: Out-of-hospital cardiac arrest, cardiopulmonary resuscitation, tissue oxygenation index, high quality cardiopulmonary resuscitation.

Introduction

More than 100,000 people die from out-of-hospital cardiac arrest (OHCA) each year in Japan (Fire and Disaster Management Agency, 2013). Although American Heart Association (AHA) guidelines for cardiopulmonary resuscitation (CPR) are regularly updated and the survival rate has been improved, the overall mortality of admitted OHCA patients still remain poor (Koenig, 2014). In fact, survival rate after 1 month varied from