The TripleCPR 16 study: Does rhythm truly needed to be checked every 2 minutes in cardiopulmonary arrest patients?

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Clinical Relevancy Statement

Current guidelines recommend a rhythm check every 2 minutes during cardiopulmonary resuscitation (CPR), but evidence for this recommendation is insufficient. Recent reports have discussed regional cerebral oxygen saturation (cerebral rSO₂) monitoring as being useful in detecting return of spontaneous circulation (ROSC) and neurological outcome using absolute value at an initial single time point during CPR on hospital arrival and at the prehospital scene. However, we think it is important to discuss the relative value and the serial change in rSO₂ values during CPR because the mechanical characteristics of each cerebral oximeter are different, and the values of rSO₂ always change depending on the patient's pathophysiology leading to cardiopulmonary arrest and the patient's situation at the time cerebral rSO₂ is measured. In this study, the amount of change until 16 minutes (i.e., relative value and serial change) was found to be the best indicator for ROSC. Moreover, we showed that the 2-minute rhythm check does not necessarily appear to be needed because coronary and cerebral perfusion decrease with the 2-minute rhythm check.

Introduction

Among the 90 CPA patients treated between 2012-2015 according to standard protocol (Japan Resuscitation Council guideline 2010)(i.e. Conventional group), 35 achieved ROSC. Mean value for initial 1 minute (i.e. rSO₂ baseline value), amount of maximum rise of rSO₂ and duration for CPR were found to be associated with prediction of ROSC (Figure 1).

Figure 1. Logistic regression analysis for the relation between ROSC and rSO₂ value.

These models were adjusted for age, sex, total number of electrical defibrillations and administrations of adrenaline, initial rhythm on EMS arrival, and with or without witness.

At 40% of baseline rSO₂ value, 87.5% of patients will achieve ROSC if the rSO₂ value rises above 20% until 16 minutes.

The amount of maximum rise from the rSO₂ baseline value during CPR could be a new index for the prediction of ROSC.

Methods

Continuous Chest Compression Resuscitation for 16 minutes (tripleCPR16) study

Objective: To evaluate whether CPR that omits the rhythm check every 2 minutes based on cerebral rSO₂ value is useful or not

Design: Multicenter prospective cohort study

Patients: CPA patients ≥16 years with non-shockable rhythm on hospital arrival

Exclusion: Patients with ventricular fibrillation, pulseless ventricular tachycardia and traumatic CPA

Setting: University hospital emergency and critical care centers

Primary Outcome: The proportion of ROSC

Secondary Outcomes:

- Achievement of target rSO₂ value
- Severe adverse events by tripleCPR 16 study protocol

Study Protocol

Baseline value (mean value for 1 minute)	Duration of continuous chest compression
≥ 50%	for 16 minutes or until by 10%
< 50% to 40%	for 16 minutes or until by 20%
< 40 %	for 16 minutes or until by 35%

After first rhythm check, rhythm check will be performed every 4 minutes. If rhythm changes to a shockable rhythm, defibrillation will be performed and rhythm check will be performed every 2 minutes.

The TOS-OR rSO₂ monitor (FUJITA MEDICAL INSTRUMENTS CO., LTD.) was used to measure cerebral rSO₂ values in this study. The monitor measures the oxygen saturation based on the Beer-Lambert law by using three different wavelengths of near-infrared LED light that have specific absorbance in oxyhemoglobin and deoxyhemoglobin.

Study
protocol
schema

Results

These results are from data obtained between Jan 2017 and March 2018.

Table 1: Patient Characteristics

	Conventional group (Non-shockable rhythm, N=86)	TripleCPR 16 study (N=131)	P
Age, median (IQR)	76 (68-84)	76 (68-83)	0.76
Male, No. (%)	57 (66.3)	80 (61.1)	0.44
Initial rhythm on hospital arrival			0.30
Asystole No. (%)	61 (70.9)	84 (64.1)	
Pulseless electrical activity No. (%)	25 (29.1)	47 (35.9)	
Witness, No. (%)	37 (43.0)	50 (38.2)	0.48
Bystander CPR, No. (%)	36 (41.9)	70 (53.4)	0.10

Table 2: Conventional (Only Non-shockable Rhythm) VS TripleCPR 16 Study Group

	Conventional group	TripleCPR 16 study	P
Patients, N.	86	131	
ROSC, N. (%)	34 (39.5%)	44 (33.6%)	0.37
Achievement of target value, N. (%)	5 (5.8%)	15 (11.5%)	0.16
Severe adverse event	0	0	

Table 4: Conventional (Only Non-shockable Rhythm) VS TripleCPR 16 Study Group (Only Osaka University Cases Except for Stanford type A Aortic dissection)

	Conventional group	TripleCPR 16 study	P
Patients, N.	82	76	
ROSC, N. (%)	32 (39.0%)	37 (48.7%)	0.22
Achievement of target value, N. (%)	5 (6.1%)	14 (18.4%)	0.02
Severe adverse event	0	0	

Table 3: Subgroup Analysis: Cases of Non-ROSC (Only Osaka University Cases in TripleCPR 16 group: N=93, Non-ROSC 55)

Cause	N (%)
Stanford type A aortic dissection	17 (30.9)
Aortic rupture	2 (3.6)
Stone heart*	20 (36.3)
Others	9 (16.4)

*Stone heart means non-sonographic cardiac activity on hospital arrival

Conclusions

The TripleCPR 16 study is ongoing. The 2-minute rhythm check does not necessarily appear to be needed.

This study result could potentially change the protocol for CPR.