Early endotracheal intubation improves neurological outcomes witnessed

OKoshi Nakagawa, EMT-P¹⁾, Ryo Sagisaka, PhD, EMT-P²⁾³⁾, Hiroshi Takyu, PhD¹⁾, Hideharu Tanaka, MD, PhD¹⁾³⁾

¹⁾ Department of Emergency Medical System, Graduate School, Kokushikan University, Tokyo, Japan

²⁾ Department of Integrated Science and Engineering for Sustainable Society, Chuo University, Tokyo, Japan

³⁾ Research Institute of Disaster Management and EMS, Kokushikan University, Japan

Background

► Few studies reported that the effectiveness of endotracheal intubation (ETI) on OHCA for good neurological outcome in Japan. Moreover, most of the reports in the world indicated no benefit ETI on the scene.

► Previous studies in Japan reported that ETI took significantly more time from collapse to insertion than Supraglottic airway device (SGA).^{1,2)}

Fig.1 ETI protocol in Japan.

【Adaptation of ETI】

1) choking by foreign body obstruction, 2) difficult to maintain airway with SGA, 3) medical director-ordered

※ EMS is not allowed Interruption of resuscitation treatment in the field, thus all patients should be transported to hospitals.

Purpose

To examine the correlation between the timing of ETI and neurological function outcome at one-month with intubated OHCA case.

Participant and Methods

► 7,410 OHCA cases

► Patients were divided into **Shockable** and **Non-shockable** cohort.

► Divided into **3 phases** by tertile of the time from EMS contacts to patients and perform ETI.

► Primary outcome: **Good neurological function (CPC1-2)**
► Secondary outcome: **return of spontaneous circulation (ROSC)**

Statistical analysis

► Multivariable logistic regression
► Referred by Late phase
► Odds ratios and 95%CI were calculated.

Results

Table 1 Participant and EMS characteristics with out-of-hospital cardiac arrest who received ETI on 3 phases^a.

Characteristics n(%)	Initial rhythm							
	All case n=521	Shockable rhythm Early phase n=205	Middle phase n=152	Late phase n=164	All case n=6889	Shockable rhythm Early phase n=2798	Middle phase n=1912	Late phase n=2179
Year								
2014	264 (50.7)	91 (44.4)	88 (57.9)	85 (51.8)	3376 (49.0)	1414 (50.5)	952 (49.8)	1010 (46.4)
2015	257 (49.3)	114 (55.6)	64 (42.1)	79 (48.2)	3513 (51.0)	1384 (49.5)	960 (50.2)	1169 (53.7)
Age, y, (SD)	69.7 (14.6)	70.9 (13.6)	66.8 (15.6)	70.9 (13.1)	78.7 (14.7)	79.7 (12.5)	78.9 (12.9)	77.4 (13.9)
sex, male	399 (76.6)	157 (76.6)	117 (77.0)	125 (76.2)	3806 (55.3)	1498 (53.5)	1059 (55.4)	1249 (57.3)
Bystander care								
Family Bystander	300 (57.6)	126 (61.5)	95 (62.5)	79 (48.2)	3925 (57.0)	1611 (57.6)	1120 (58.6)	1194 (54.8)
CPR by bystander								
Conventional CPR	45 (8.6)	19 (9.3)	12 (7.9)	14 (8.5)	538 (7.8)	237 (8.5)	157 (8.2)	144 (6.6)
Hands only CPR	215 (41.3)	101 (49.3)	59 (38.8)	55 (33.5)	3040 (44.1)	1410 (50.4)	819 (42.8)	811 (37.2)
Public Access Defibrillation	23 (8.2)	11 (10.2)	5 (6.0)	7 (8.1)	66 (1.7)	35 (2.2)	14 (1.3)	17 (1.4)
Etiology								
Cardiogenic	447 (85.8)	181 (88.3)	133 (87.5)	133 (81.1)	3012 (43.7)	1196 (42.7)	846 (44.3)	970 (44.5)
Non cardiogenic								
Stroke	5 (1.0)	1 (0.5)	0 (0.0)	4 (2.4)	158 (2.3)	57 (2.0)	50 (2.6)	51 (2.3)
Respiratory disease	31 (6.0)	12 (5.9)	11 (7.2)	8 (4.9)	2475 (35.9)	1152 (41.2)	669 (35.0)	654 (30.0)
Malignant tumor	4 (0.8)	1 (0.5)	0 (0.0)	3 (1.8)	145 (2.1)	45 (1.6)	41 (2.1)	59 (2.7)
Extrinsic	4 (0.8)	1 (0.5)	0 (0.0)	3 (1.8)	189 (2.7)	56 (2.0)	69 (3.6)	64 (2.9)
Others	30 (5.8)	9 (4.4)	8 (5.3)	13 (7.9)	910 (13.0)	292 (10.4)	237 (12.4)	381 (17.5)
EMS treatments								
Defibrillation by EMS	495 (95.0)	194 (94.6)	148 (97.4)	153 (93.3)	318 (4.6)	124 (4.4)	75 (3.9)	119 (5.5)
Epinephrine	274 (52.6)	101 (49.3)	80 (52.6)	93 (56.7)	2931 (42.6)	1232 (44.0)	829 (43.4)	870 (39.9)
Outcomes								
CPC1-2	44 (8.5)	26 (12.7)	10 (6.6)	8 (4.9)	84 (1.2)	46 (1.6)	19 (1.0)	19 (0.9)
ROSC	104 (20.0)	56 (27.3)	24 (15.8)	24 (14.6)	1245 (18.1)	619 (22.1)	370 (19.4)	256 (11.8)

Table 2 Odds ratios of favorable neurological outcome by quartile time of ETI.

			OR (95%CI)	Early phase (1-8min)	Middle phase (9-12min)	Late phase (13-17min)
Shockable	CPC 1-2	Unadjusted		2.83 (1.25-6.44)	1.37 (0.53-3.58)	Reference
		Adjusted ^a		2.08 (0.84-5.13)	0.99 (0.36-2.75)	Reference
	ROSC	Unadjusted		2.19 (1.29-3.73)	1.09 (0.59-2.02)	Reference
		Adjusted ^a		3.68 (1.99-6.79)	1.57 (0.81-3.04)	Reference
Non-shockable	CPC 1-2	Unadjusted		1.90 (1.11-3.25)	1.14 (0.60-2.16)	Reference
		Adjusted ^a		1.81 (1.02-3.22)	1.12 (0.58-2.16)	Reference
	ROSC	Unadjusted		2.13 (1.82-2.50)	1.80 (1.52-2.14)	Reference
		Adjusted ^a		2.87 (2.39-3.44)	2.21 (1.82-2.67)	Reference

Discussion

► **Early ETI within 8 min contributed to improvement of good neurological outcome** at one month on OHCA with non-shockable rhythm than that of Late ETI intubation.

► Ahn, et al. reported maintaining cerebral oxygen saturation in non-shockable rhythm correlates with ROSC.^{3,4)}

► The number of ETI cases in Shockable rhythm was lower because Shockable has higher possibility of ROSC and CPC1-2 by factors other than ETI.

- 1) Hasegawa K, et al., JAMA. 2013; 309(3):257-66.
- 2) Kajino K, et al., Critical care.2011;15(5):R236.
- 3) Ahn A, et al., Resuscitation. 2013;84(12):1713-6.
- 4) Rajan S, et al., Resuscitation. 2017;114:157-63.

Conclusion

► In Non-shockable rhythm, **Early ETI within 8 min** shows significantly correlated with good neurological outcome.

► Further, improving the protocol for rapid ETI insertion should be necessary.

Correspondence

Koshi Nakagawa, EMT-P E-mail: koshi5461@gmail.com
Graduate School of Emergency Medical System, Kokushikan University
7-3-1, Nagayama, Tama City, Tokyo, 205-8515, Japan.