Comparison of Bag-Valve-Mask Hand-Sealing Techniques in a Simulated Model

Annals of Emergency Medicine Volume 63, no. 1 : January 2014
David Otten, MD; Michael M. Liao, MD, MSc; Robert Wolken, RRT; Ivor S. Douglas, MD;Ramya Mishra, MD; Amanda Kao, MD; Whitney Barrett, MD; Erin Drasler, MD;Richard L. Byyny, MD, MSc;J ason S. Haukoos, MD, MSc

Date: 2013/01/21
Supervisor:吳柏衡醫師
Reporter: PGY高舒庭

Introduction

- Bag-valve-mask ventilation is an essential element of emergency airway management
  → mask sealing against the face with 1-handed, 2-handed techniques or, modified 2-handed technique

Hypothesis

- *The modified 2-handed technique* would provide greater expired tidal volume than *the 2-handed technique*.
- *Both 2-handed techniques* would provide greater expired tidal volume than *the 1-handed technique*

Study Design

Bag-Valve-Mask Hand-Sealing Techniques

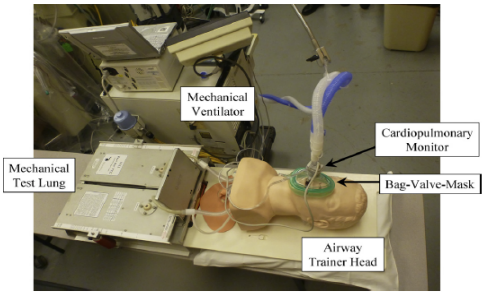


Figure 2. A semiclosed-circuit simulated model for bag-valve-mask ventilation.

Study Design

- This model isolated the only possible source of air leak to the contact point between the mask and the mannequin face

→*Detect differences in expired tidal volume with varying degrees of air leak*
→*inserted a pillow to provide some tactile feedback on the degree of downward pressure applied to the trainer head.*

- The mechanical ventilator provide an inspired tidal volume of 600 mL, respiratory rate of 20 breaths/min, peak inspiratory flow rate of 100 L/minute, and positive end-expiratory pressure of 0.
- The mechanical test lung was set at a constant lung compliance of 0.04 L per cm H2O

Selection of Participants

- Recruitment from Denver Health Medical Center
- Inclusion:
  - ✓ respiratory therapists, medical students, resident physicians, attending physicians, critical care or emergency department registered nurses, and paramedics.
- Exclusion:
  - ✓ who could not be expected to physically perform the necessary tasks required for this study
- This outcome was expressed as *a percentage of the maximum possible expired tidal volume* during the 5-minute period.

Methods of Measurement

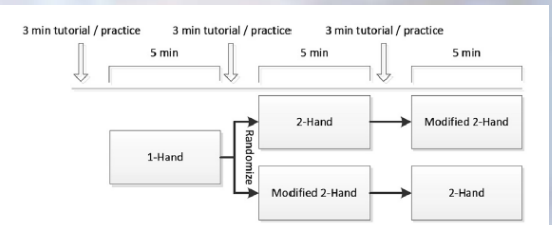


Figure 3. Experiment timeline and randomization scheme for 3 bag-valve-mask hand-sealing techniques.

Statistical Analysis

- Expired tidal volume, was automatically recorded by the Novametrix NICO (Novametrix Medical Systems) cardiopulmonary monitor, using linking software andthen electronically extracted to an Excel spreadsheet
- All statistical analyses were performed with SAS or Stata
- Confidence intervals (CIs) for medians were estimated with bias-corrected and accelerated bootstrap

Results

- Female subjects exhibited smaller hand width and length than male
- Women exhibited weaker initial dominant hand grip strength than men (26 versus 44 kg force; median difference 19 kg force [95% CI 17 to 21 kg force]).

Table 1. Characteristics of subjects enrolled.

Subject Characteristics	Subjects, No. (%), n = 52	
Male sex	28	(54)
Provider type		
Medical student/resident/attending physician	36	(69)
Respiratory therapist	11	(21)
Other	5	(10)
BVM experience level in emergency situations		
None	5	(10)
Models only	5	(10)
<5 patients	10	(19)
≥5 patients	32	(62)
Encounters with difficult BVM		
Never had difficult BVM	14	(27)
Experienced a few difficult BVMs	29	(56)
Experienced many difficult BVMs	9	(17)
Hand size		
Fifth finger to thumb (width) (IQR), median cm	20.2	(19.1, 21.6)
Wrist distal crease to tip of third finger (length) (IQR), median cm	18.9	(17.8, 19.4)
Right-handed	48	(92)

BVM, Bag-valve-mask ventilation; IQR, interquartile range.

Results

- 1-handed bag-valve-mask technique resulted in lower median expired tidal volume percentage than either 2-handed bag-valve-mask technique.
- Female subjects performing 1-handed bag-valve-mask technique had the lowest median expired tidal volume percentage.

Table 2. Median percentage of total possible expired tidal volume for 52 subjects overall and within subgroups during each of 3 bag-valve-mask hand-sealing techniques performed for 5 minutes.

	1-Handed BVM, n = 51*		2-Handed BVM, n = 52		Modified 2-Handed BVM, n = 52	
Subject Categories	Median (%)	(95% CI)†	Median (%)	(95% CI)	Median (%)	(95% CI)
All subjects	31	(17–51)	85	(78–91)	85	(82–90)
Female subjects	10	(7–17)	76	(67–87)	83	(74–91)
Male subjects	57	(33–67)	88	(82–94)	90	(83–92)
Experienced subjects‡	28	(14–58)	87	(81–92)	89	(83–93)
Inexperienced subjects	33	(10–56)	77	(72–91)	80	(74–90)

CI, confidence interval.
*One subject was missing data on 1-handed BVM because of a failure in the recording instrument transmitting data during the session; thus, only 51 subjects were analyzed.
†Median 95% CIs estimated with bias-corrected and accelerated bootstrap.
‡Experienced subjects defined as having performed BVM ventilation in 5 or more patients in emergency situations.

Results

- Expired tidal volume did not differ between 2-handed or modified 2-handed bag-valve-mask techniques at any point during the 5-minute session.

Comparisons	Median Difference, %	95% CI
All 5 min		
1H–2H*	−47	−62 to −34
1H–m2H*	−56	−65 to −29
2H–m2H	−0	−2 to 2
First 4 min		
1H–2H*	−45	−59 to −33
1H–m2H*	−54	−65 to −28
2H–m2H	−1	−2 to 1
First 3 min		
1H–2H*	−47	−60 to −32
1H–m2H*	−52	−67 to −28
2H–m2H	−1	−2 to 2
First 2 min		
1H–2H*	−47	−59 to −30
1H–m2H*	−51	−68 to −28
2H–m2H	−0	−2 to 1
First 1 min		
1H–2H*	−46	−59 to −25
1H–m2H*	−53	−66 to −20
2H–m2H	−1	−4 to 2

1H, 1-Handed BVM technique; *2H*, 2-handed BVM technique; *m2H*, modified 2-handed BVM technique.
*One subject was missing data on 1-handed BVM because of a failure in the recording instrument transmitting data during the session; thus, only 51 subjects were analyzed.

Results

- Women achieved lower median expired tidal volume percentage than men in both 1-handed and 2-handed bagvalve- mask techniques
- *The modified 2-handed bag-valve-mask technique, median expired tidal volume was similar between women and men*
- *Experienced subjects performed similarly with all 3 bag-valve-mask hand-sealing techniques.*

Table 4. Median difference in the percentage of total possible expired tidal volume between sexes and experience levels within the strata of 3 bag-valve-mask hand-sealing techniques.

	1-Handed BVM*		2-Handed BVM		Modified 2-Handed BVM	
Comparisons	Median Difference, %	95% CI	Median Difference, %	95% CI	Median Difference, %	95% CI
Female-male (all 5 min)	−35	(−53 to −17)	−10	(−21 to −3)	−5	(−12 to 1)
Female-male (first 4 min)	−37	(−55 to −20)	−10	(−21 to −2)	−5	(−12 to 1)
Female-male (first 3 min)	−41	(−57 to −19)	−10	(−20 to −2)	−4	(−11 to 1)
Female-male (first 2 min)	−42	(−60 to −18)	−9	(−18 to −2)	−4	(−9 to 0)
Female-male (first 1 min)	−40	(−60 to −17)	−10	(−18 to −3)	−4	(−8 to 2)
Inexperienced-experienced (all 5 min)†	−0	(−16 to 16)	−4	(−14 to 5)	−6	(−14 to 1)
Inexperienced-experienced (first 4 min)	0	(−14 to 18)	−4	(−13 to 4)	−6	(−14 to 0)
Inexperienced-experienced (first 3 min)	0	(−15 to 16)	−3	(−12 to 4)	−6	(−14 to 0)
Inexperienced-experienced (first 2 min)	−3	(−17 to 15)	−2	(−10 to 4)	−5	(−12 to 0)
Inexperienced-experienced (first 1 min)	−1	(−17 to 17)	1	(−6 to 8)	−4	(−9 to 2)

CI, confidence interval.
*One subject was missing data on 1-handed BVM because of a failure in the recording instrument transmitting data during the session; thus, only 51 subjects were analyzed.
†Experienced subjects defined as having performed BVM ventilation in 5 or more patients in emergency situations.

Limitations

- it is unclear whether the same results would be achieved in a human mode
- Effective bag-valve-mask ventilation in practice can depend on factors not evaluated in our study,
  - ✓ *nasal or oral airways, head positioning, and patient facial characteristics*.
- Subjects may not have remained blinded to the study purpose as the experiment proceeded and may have exaggerated differences between ventilation techniques
- Avoid multivariable adjustment because of the modest sample size.

Discussion

- Sexes exhibited similar expired tidal volume percentage with the modified 2-handed technique.
  - ✓ *Experience did not seem to influence bag-valve-mask performance with any of the techniques*
- Both 2-handed techniques exhibited higher expired tidal volume percentages than the 1-handed technique
  - ✓ Suggests that 2-handed techniques should be favored over 1-handed bag-valve-mask techniques.
- The modified 2-handed technique may have particular advantages in situations in which the *provider has smaller hands or weaker grip strength or is faced with a difficult patient for mask-face seal*

Editor's Capsule Summary

What is already known on this topic

Achieving a mask seal during bag-valve-mask ventilation is difficult.

What question this study addressed

Is bag-valve-mask seal best with 1-handed, 2-handed, or modified 2-handed technique?

What this study adds to our knowledge

In this controlled trial using a standardized ventilation mannequin, 2-handed mask sealing resulted in higher tidal volumes than 1-handed technique. Tidal volumes for 2-handed and modified 2-handed techniques were similar.

How this is relevant to clinical practice

Although these mannequin-based results require in vivo validation, the findings support bag-valve-mask ventilation with 2-handed mask-sealing techniques.

Effect of the Duration of Emergency Department Observation on Computed Tomography Use in Children With Minor Blunt Head Trauma

Annals of Emergency Medicine 597Volume 62, no. 6 : December 2013

Deborah Schonfeld, MD; Brianna M. Fitz, BA; Lise E. Nigrovic, MD, MPH

Date: 2013/01/21

Supervisor:吳柏衡醫師

Reporter: PGY高舒庭

Introduction

- Half a million children present to the emergency department (ED) for evaluation of blunt head trauma
  - ✓ *Cranial computed tomography (CT)* is the criterion standard for the diagnosis a of traumatic brain injury
- Exposes children to ionizing radiation that increases the lifetime risk for radiation-associated malignancies
  - ✓ CT allows clinicians to selectively image only children whose *symptoms evolve or fail to improve*.
- The American Academy of Pediatrics has long recognized the role of an observation period in the management of children with minor blunt head trauma
  - ✓ *Observation before the decision* was associated with a significantly lower rate of *overall CT use*, with no increase in the rate of significant injuries

Study Design

- Hypothesis:
  - ED observation will be associated with *a time-dependent decrease* in CT use for children without a delay in diagnosis of a clinically important traumatic brain injury.
- *Prospective observational cohort study* of all children who presented to a single pediatric ED for evaluation of minor blunt head trauma since April 27, 2011 to December 31, 2012
- *Age-based PECARN traumatic brain injury prediction rules* was used and suggested management based on risk classification

Table 1. PECARN traumatic brain injury risk groups for children with minor head trauma (Glasgow Coma Scale score >14).[2]

PECARN TBI Risk Group	Predictors: Children Aged <2 Years	Predictors: Children Aged ≥2 Years
High	Altered mental status*	Altered mental status*
	Palpable skull fracture	Signs of basilar skull fracture†
Intermediate	Severe injury mechanism‡	Severe injury mechanism‡
	Loss of consciousness ≥5 s	Any loss of consciousness
	Nonfrontal hematoma	Vomiting
	Not acting right per parents	Severe headache
Very low	None	None

TBI, traumatic brain injury.
*Glasgow Coma Scale score 14, agitation, sleepiness, slow response, or repetitive questioning.
†Retroauricular bruising (battle sign), periorbital bruising (raccoon eyes), cerebrospinal fluid otorrhea or hemotympanum.
‡Motor vehicle crash with patient ejection, death of another passenger, or rollover; pedestrian or bicyclist without helmet struck by motorized vehicle; falls (of >3 feet for children <2 years or >5 feet for children ≥2 years); or head struck by high-impact object.

Participant

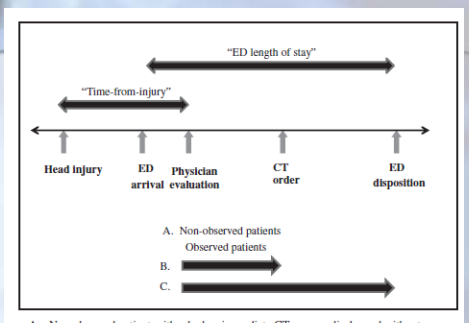
- Physicians trained in *pediatric emergency medicine* (attending physicians and fellows), as well as *general pediatricians*
- Inclusion:
  - ✓ *children younger than 18 years* and with *a Glasgow Coma Scale score of 14 or 15*, presenting to the ED for evaluation of blunt head trauma sustained within 24 hours of presentation
- Exclusion:
  - ✓ *trivial injury, neurologic comorbidities, or bleeding disorders*
  - ✓ Children who had neuroimaging performed before study form completion

Methods

- Initial patient assessment
- Completed a standardized study form
  - ✓ indicated the date and time of patient head injury
- Pediatric Emergency Care Applied Research Network (PECARN) traumatic brain injury clinical predictors
- Observed VS Non-observed patient
  - ✓ clinicians were asked to indicate how symptoms changed during the observation period and the indications for obtaining neuroimaging

Methods

- *The times of ED arrival, physician evaluation, ED CT order placement* (if a CT was ordered), and *ED disposition* (discharge or hospital admission) were abstracted from the ED electronic tracking system.
- *Patient race, ethnicity, and insurance status* were obtained from patient registration data.
- We also reviewed the electronic medical records from the *initial ED visit and for the 7 days after the initial injury*
- Our primary outcome measure was the *performance of a cranial CT scan* (yes versus no) with secondary of *ED length of stay*



A. Non-observed patients either had an immediate CT or were discharged without neuroimaging
B. Observed patients: ED observation time for children who undergo a CT scan
C. Observed patients: ED observation time for children who are discharged from the ED without a CT scan

Statistical Analysis

- Described the data with descriptive statistics with *95% confidence intervals (CIs) or population proportions*
- *Bivariable analysis* comparing the clinical characteristics and management of children with minor head trauma who were observed versus not observed in the ED before CT decisionmaking.
- Using rate differences and median times with the *Hodges-Lehmann method* to compare categorical variables
- *Multivariable logistic regression* to measure the association between ED observation time and CT rate

Statistical Analysis

- Assuming a baseline CT rate for children with minor blunt head trauma of 25%, based on an institutional CT rate of 30% in 2005 and an assumed temporal decrease during the intervening period
- Then powering study to detect a 20% decrease in CT rate from baseline associated with clinical observation
- Using *Stata* to calculated the median differences and the *SPSS* for all other analyses

Results

- We enrolled 98 physicians in this observational study.
  - ✓ 55 (56%) ng
  - physician e and 2
  - emergenc
  - ✓ 22 (20%) e fellows
  - ✓ 21were g

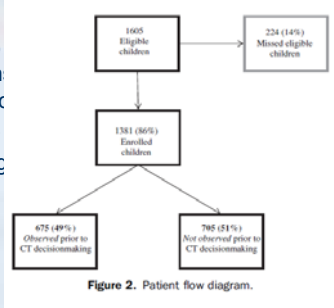


Figure 2. Patient flow diagram.

Results

- 271 children(20% of study population) had a CT performed and 1 child had a cranial MRI (0.07%), for an overall neuroimaging rate of 20%

Table 2. Comparison of characteristics between children who were observed versus those who were not before the decision whether to obtain a cranial CT.

Characteristic	Observed, N = 676, n/N (%)	Nonobserved, N = 705, n/N (%)	Rate Difference, n% (95% CI)
Sex (male)	394/676 (58)	439/705 (62)	−4 (−9 to 0)
Age ≥2 y	460/676 (68)	412/705 (58)	10 (5 to 15)
Race			
White	327/676 (48)	340/705 (48)	0 (−5 to 5)
Black	102/676 (15)	108/705 (15)	0 (−4 to 4)
Other	247/676 (37)	257/705 (37)	0 (−5 to 5)
Ethnicity			
Hispanic	124/623 (20)	146/659 (22)	−2 (−7 to 2)
Non-Hispanic	499/623 (80)	513/659 (78)	2 (−2 to 7)
Insurance			
Private	426/673 (63)	452/701 (65)	−2 (−6 to 4)
Public	233/673 (35)	234/701 (33)	2 (−4 to 6)
None	14/673 (2)	15/701 (2)	0 (−1 to 1)
PECARN TBI risk group			
Very low	327/669 (49)	397/700 (57)	−8 (−13 to −3)
Intermediate	301/669 (45)	197/700 (28)	17 (12 to 22)
High	41/669 (6)	106/700 (15)	−9 (−12 to 6)
Patient outcome			
CT performed	32/676 (5)	240/705 (34)	−28 (−32 to −24)
Positive CT findings*	4/676 (1)	49/705 (7)	−7 (−9 to −5)
Clinically important TBI†	0/676 (0)	8/705 (1)	−1 (−2 to 0)
Hospital admission Rate	21/676 (3)	76/705 (11)	−8 (−10 to −5)

724(53%)
498(36%)
147(11%)

*Skull fracture or traumatic brain injury defined as intracranial hemorrhage or contusion, cerebral edema, traumatic infarction, midline shift or signs of brain herniation, diffuse axonal injury, or pneumocephalus.
†Traumatic brain injury resulting in death, neurosurgical intervention, intubation for longer than 24 hours, or hospital admission for 2 nights or longer.

Results

- *CT rates varied by PECARN traumatic brain injury risk group*:
  - ✓ 4% of patients in the very low risk group
  - ✓ 26% in the intermediate-risk group
  - ✓ 69% in the high-risk group
- *The number of positive CT results was higher for the children who were not observed* before CT decisionmaking
  - ✓ The most common type of positive CT result was a nondisplaced skull fracture (47%).
  - ✓ 8 patients in our study (0.6% of the study cohort) had a clinically important traumatic brain injury (1 required neurosurgical intervention and 7 spent 2 or more nights in the hospital for management of their head injuries)

- Clinical symptoms improved for most children during the period of observation.
- The CT rate was lower for children who were observed(5% observed versus 34% nonobserved).
- ***Every hour of ED observation was associated with a time-dependent decrease in CT rate overall***
  - ✓ observed a similar time-dependent decrease in cranial CT rate in each of th sk groups

Table 4. The relationship between ED observation time in hours and cranial CT rate by PECARN TBI risk group.

PECARN TBI Risk Group	Adjusted OR* (95% CI)
Overall	0.31 (0.25–0.37)
Very low	0.47 (0.31–0.73)
Intermediate	0.28 (0.21–0.36)
High	0.11 (0.05–0.24)

*Adjusted for time from injury, patient age, sex, physician type (pediatric emergency medicine versus general pediatrics), and study month.

Limitation

- Limitation of ability to determine whether ED observation before CT decisionmaking could be associated with a clinically important delay in head injury diagnosis
- The study times we chose may only approximate the actual times at which various events occurred
- Clinical follow-up was limited to electronic medical record review for return visits
- Cannot be certain that children who did not have a CT performed did not meet our positive CT result definition
- This study was conducted at a single institution, which may limit its generalizability to other clinical settings

Discussion

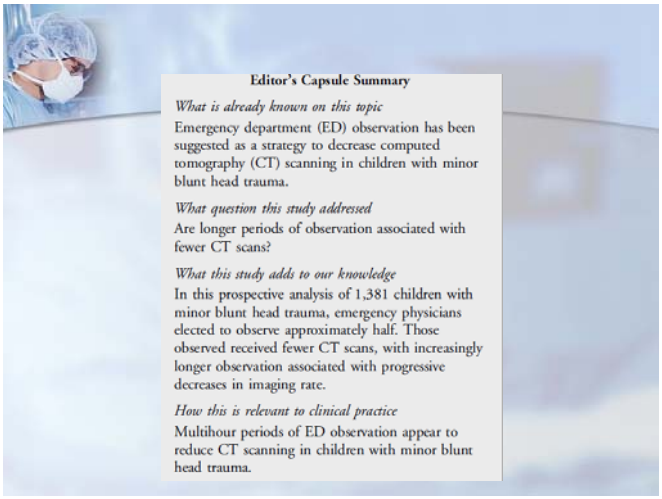
- Observation has been previously associated with a *reduction in cranial CT rate* in a large multicenter study of children presenting to the ED for evaluation of head trauma
  - Every hour of ED observation *reduced rate of CT use by 70% on average* after adjustment for other patient and provider factors
- The proportion of the clinicians who chose to observe a child with blunt head trauma before CT decisionmaking *increased significantly*
  - (15% in the PECARN study of observation conducted at 25 participating institutions14 to approximately 50% in our current investigation)

Discussion

- Observation would be most useful for *children at intermediate risk*, for whom the need for cranial CT may not be entirely clear at the initial evaluation
  - 60% of children in the intermediate PECARN traumatic brain injury risk group were observed before CT decisionmaking.
  - The majority of these patients had resolution of symptoms during the course of the observation period
- *The risk of a clinically significant traumatic brain injury for children in the very low-risk group is low*, suggesting that many of these children might be safely discharged home without requiring ED observation

Discussion

- Our study was not designed to determine the optimal period of observation before CT decisionmaking.
- We were *unable to exclude the possibility that clinical observation beforehand would lead to a delay in the diagnosis* of a clinically important traumatic brain injury.
- Recent surveys *suggest that parents prefer observation in the ED over immediate CT* in the management of their child's head injury



Editor's Capsule Summary

What is already known on this topic

Emergency department (ED) observation has been suggested as a strategy to decrease computed tomography (CT) scanning in children with minor blunt head trauma.

What question this study addressed

Are longer periods of observation associated with fewer CT scans?

What this study adds to our knowledge

In this prospective analysis of 1,381 children with minor blunt head trauma, emergency physicians elected to observe approximately half. Those observed received fewer CT scans, with increasingly longer observation associated with progressive decreases in imaging rate.

How this is relevant to clinical practice

Multihour periods of ED observation appear to reduce CT scanning in children with minor blunt head trauma.

Near infrared spectrophotometry (cerebral oximetry) in predicting the return of spontaneous circulation in out-of-hospital cardiac arrest

American Journal of Emergency Medicine 32 (2014) 14–17

Kalkan Asim , Ersunan Gokhan, Bilir Ozlem, Yavasi Ozcan, Ozel Deniz, Kayayurt Kamil,Ziyan Murat, Coskun Aydın, Yeniocak Selman

Date: 2013/01/21
Supervisor:吳柏衡醫師
Reporter: PGY高舒庭

Introduction

- Successful resuscitation means not only achieving spontaneous circulation, but also the oxygenation of vital organs
  - The use of cerebral oximetry to assess brain oxygenation has risen in recent years.
  - Prolonged hypoxia in brain tissue increases mortality in arrest patients
- Near infrared spectrophotometry (NIRS) is particularly used to evaluate cerebral oxygenation in cardiovascular surgery
- The purpose of this study was to *determine whether or not spontaneous circulation had returned by evaluating the cerebral saturation of patients* with out-of hospital cardiac arrest.

NIRS(Cerebral Oximetry)

- Frontal cortex hemoglobin saturation is calculated by subtraction of the two signals
- Limits of detection for the device include a hemoglobin-oxygen saturation of b15% or N95% and a cortical tissue depth of N2 cm[

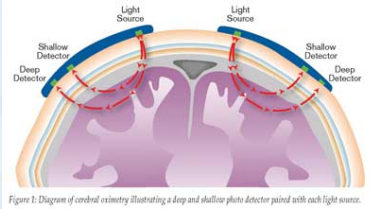


Figure 1: Diagram of cerebral oximetry illustrating a deep and shallow photo detector paired with each light source.

Study Design

- This study was performed at the Recep Tayyip Erdogan University Medical Faculty Emergency Medicine Department, Turkey, betweenJanuary and June, 2013
- *Thirty patients* with a mean age of 64.09±13.66 (mean±SD) years(21-82 years) brought in by the emergency ambulance service after unwitnessed out-of-hospital arrest were included
  - ✓ *Seven patients* were subsequently excluded due to diagnosis of cerebrovascular event
- CPR to the patients in accordance with European Resuscitation Council Guidelines 2010 on site and during transport as required prior to admission to the ED
  - ✓ *The duration of the cardiac arrest before resuscitation was not determined.*

Study Design

- Monitoring with cerebral oximetry was provided as soon as the CPR team started resuscitation.
- CPR in line with the advanced cardiac life support *American Heart Association 2010 guideline* was administered to all patients.
  - ✓ Duration of CPR was determined as a maximum 30 minutes.
  - ✓ Cerebral saturations were monitored until patients were declared dead or until spontaneous circulation returned
  - ✓ Patients were met by a 6-member resuscitation team in the ED.(2 doctors, 2 nurses, and 2 paramedics, and one of the nurse task was to monitor and record cerebral saturation)

Statistical Analysis

- Descriptive statistics are presented as frequency, percentage, mean, standard deviation and median, minimum and maximum values.
- Fisher exact test or the Pearson χ2 test were used in the analysis of relations between categorical variables
- The Mann Whitney U test was used in the analysis of differences between the 2 groups measurement values
- Receiver operating characteristic (ROC) analysis was performed in the calculation of *sensitivity, specificity and area under curve (AUC) values* of specific variables in differentiating surviving or non-surviving patients

Results

- *The highest SCO2 values* and *the increase in SCO2 values* in the right and left frontal lobes *were significantly higher in the patients in whom spontaneous circulation* was restored compared to the others
- *No statistically significant difference* was determined *between the lowest right and left lobe SCO2 values*

Table 1
Patient characteristics and demographic data

Characteristics	Number (%)
Age (mean ± SD)	64.09 ± 13.66
Male	11/23 (47.8)
Initial rhythm VF	11/23(47.8)
Initial rhythm asystolic	9/23 (39.1)
Initial rhythm PEA	3/23 (13)
Full recovery	7/23 (30.4)

Table 2
NIRS data and levels of increase measured during CPR

Variable	Survival NO (% min-max)	Survival YES (% min-max)	P
Highest right Sco_2 (%)	24.5 (15-49)	68.86 (43-93)	<.001
Highest left Sco_2 (%)	22.5 (14-53)	68 (53-92)	<.001
Lowest right Sco_2 (%)	15 (14-31)	18 (15-47)	<.356
Lowest left Sco_2 (%)	17 (13-33)	18 (17-52)	<.268
Level of right frontal Sco_2 increase (%)	5 (0-18)	52 (17-52)	<.001
Level of left frontal Sco_2 increase (%)	3 (0-20)	50 (11-74)	<.001

Results

Table 3
Analysis of patients' glucose and blood gas value by return of otherwise of spontaneous circulation

Variable	General	Survival No	Survival Yes	P
Glucose	198 (75-658)	171 (75-467)	302 (156-658)	.038*
Blood has Ph	7.01 (6.83-7.33)	7.01 (6.85-7.33)	7.04 (6.83-7.27)	.763
Pco_2	56.0 (26-76)	55.5 (26-76)	56.0 (27-72)	.841
Po_2	69.0 (40-135)	64.5 (40-110)	97.0 (58-135)	.038*

Table 4
ROC analysis data

Parameter	Cut-off	Alive	Ex	Odds Ratio 95% CI	AUC	Performance
Level of increase, right	>16 ≤16	7 0	2 14	4.504 (1.326-15.385)	0.938 P = .001	Sens: 87.5% Spec: 100% PPV: 100% NPV: 77.8%
Level of increase, left	>20 ≤20	5 2	0 16	9 (2.437-33.244)	0.857 P = .008	Sens: 100% Spec: 85.7% PPV: 88.9% NPV: 100%
Glucose	>198 ≤198	6 1	5 11	13 (1.239-140.679)	0.772 P = .042	Sens: 68.8% Spec: 85.7% PPV: 91.7% NPV: 54.5%
PO2	>66 ≤66	6 1	6 10	10 (0.957-140.490)	0.741 P = .071	Sens: 62.5 % Spec: 85.7 % PPV: 90.9% NPV: 50%

Sens, sensitivity; Spec, specificity; PPV, positive predictive value; NPV, negative predictive value

Discussion

- Those patients in our study with out-of-hospital cardiac arrest with *a rise in SCO2 during CPR had a higher survival rate* than those with no rise.
- This is the first study to evaluate the relationship between return or otherwise of spontaneous circulation and changes in cerebral saturations in patients with pre-hospital cardiac arrest
- They thus suggested that NIRS could be used in predicting re-arrest.
  - ✓ Even experienced resuscitators are known to lose time looking at pulse rates in arrest patients.

Discussion

- In our study, *cerebral saturations measured using NIRS rising by more than 16% in the right frontal lobe and by more than 20% in the left frontal lobe* in patients was determined as a predictor or return of spontaneous circulation.
- NIRS is used to monitor trends in changes in cerebral perfusion *in other disease states*.
- Every minute that the brain is deprived of oxygen is important in patients with out-of-hospital cardiac arrest, and that NIRS is a good method of determining how much the brain is affected and of predicting survival.
- Limitation:
  - ✓ Post-arrest cell death usually takes place in 4 to 8 minutes. Even if spontaneous circulation is restored in these patients, it may not be possible to restore cerebral circulation
  - ✓ our study is that neuroprotective agents and hypothermia were not used.

Take Home Message

- Monitoring patients with NIRS(cerebral oximetry)which is noninvasive technique may be a good method of predicting return of spontaneous circulation!!!!!

Thanks for your attention!!!!