Tracheální intubace během kardiopulmonální resuscitace up-to-date 2018

MUDr. Josef Škola

20th Colours of Sepsis, Ostrava, 1. února 2018
self, and to go on learning for the rest of his professional career. The new curriculum will also allow students to have a certain measure of choice of subjects, so that they may follow alternative paths according to their aptitude and desires. The clinics in the wards will be rearranged to be smaller, and it is hoped that students will take a more personal responsibility for their patients, and have laboratories in which to carry out the simpler investigations on them.

Another aim is to break down the barrier that tends to exist between the preclinical subjects on the one hand and the clinical subjects on the other. It would be wrong of me to prejudge a new curriculum that has not yet been put into operation, but I hope that the clinical importance of preclinical subjects will be stressed at an early stage in the course, though I agree with the view that the encouragement of critical habits of thought should be an objective of the teaching in the preclinical period. I am sorry that pharmacology is to be made a preclinical subject and that the happy union of pharmacology and therapeutics in fourth-year teaching has been dissolved. I hope, too, that the departments of pathology and bacteriology, now shown in the new draft programme as doing their teaching in the fourth

from the common purpose to indulge in internecine pyrotechnics.

REFERENCES

NOTES ON CARDIAC RESUSCITATION, INCLUDING EXTERNAL CARDIAC MASSAGE

BY
R. W. PORTAL, M.B., M.R.C.P.*
J. G. DAVIES
B. F. ROBINSON, M.B., M.R.C.P.
A. G. LEATHAM, M.B., F.R.C.P.

From St. George's Hospital, London
Apparatus for Maintaining Ventilation

The Portex "resuscitube" is probably the simplest airway for emergency use and enables "mouth-to-mouth" respiration to be carried out without direct contact with the patient. The Ambu resuscitator is convenient for manual inflation and may be used with a mask or endotracheal tube. Intubation is clearly the best method of ensuring an airway and should be performed as soon as possible after collapse. This technique might be more widely taught. If unskilled intubation proves difficult, time should not be lost and a temporary pharyngeal airway should be inserted.

A. G. LEATHAM, M.B., F.R.C.P.
From St. George's Hospital, London
Association Between Tracheal Intubation During Adult In-Hospital Cardiac Arrest and Survival

Lars W. Andersen, MD, MPH, PhD; Asger Granfeldt, MD, PhD, DMSc; Clifton W. Callaway, MD, PhD; Steven M. Bradley, MD, MPH; Jasmeet Soar, FRCA, FFICM, FRCP; Jerry P. Nolan, FRCA, FRCP, FFICM, FCEM (Hon); Tobias Kurth, MD, ScD; Michael W. Donnino, MD, for the American Heart Association’s Get With The Guidelines–Resuscitation Investigators
Key Points

**Question** Is tracheal intubation during adult in-hospital cardiac arrest associated with survival?

**Findings** In a study of 86,628 adults with in-hospital cardiac arrest using a propensity-matched cohort, tracheal intubation within the first 15 minutes was associated with a significantly lower likelihood of survival to hospital discharge compared with not being intubated (16.3% vs 19.4%, respectively).

**Meaning** These findings do not support early tracheal intubation for adult in-hospital cardiac arrest.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients, No. (%)</th>
<th>No Intubation (n = 36 464)</th>
<th>Intubation (n = 71 615)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In place at time of cardiac arrest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noninvasive assisted ventilation</td>
<td>11 117 (10)</td>
<td>8164 (22)</td>
<td>2953 (4)</td>
</tr>
<tr>
<td>Dialysis</td>
<td>2912 (3)</td>
<td>944 (3)</td>
<td>1968 (3)</td>
</tr>
<tr>
<td>Implantable cardiac defibrillator</td>
<td>1913 (2)</td>
<td>539 (1)</td>
<td>1374 (2)</td>
</tr>
<tr>
<td>Intra-arterial catheter</td>
<td>4485 (4)</td>
<td>2209 (6)</td>
<td>2276 (3)</td>
</tr>
<tr>
<td><strong>Electrocardiogram</strong></td>
<td>80 864 (75)</td>
<td>30 069 (82)</td>
<td>50 795 (71)</td>
</tr>
<tr>
<td><strong>Pulse oximeter</strong></td>
<td>62 634 (58)</td>
<td>24 678 (68)</td>
<td>37 956 (53)</td>
</tr>
<tr>
<td><strong>Vasoactive agents</strong></td>
<td>16 056 (15)</td>
<td>7822 (21)</td>
<td>8234 (12)</td>
</tr>
</tbody>
</table>
Table 1. Patient, Hospital, and Event Characteristics Among Patients With In-Hospital Cardiac Arrest Without vs With Intubation in the First 15 Minutes of Resuscitation in the Full Cohort (continued)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients, No. (%)</th>
<th>No Intubation (n = 36464)</th>
<th>Intubation (n = 71615)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (N = 108079)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency department</td>
<td>10965 (10)</td>
<td>3695 (10)</td>
<td>7270 (10)</td>
</tr>
<tr>
<td>Floor with telemetry</td>
<td>22215 (21)</td>
<td>6243 (17)</td>
<td>15972 (22)</td>
</tr>
<tr>
<td>Floor without telemetry</td>
<td>27249 (25)</td>
<td>6091 (17)</td>
<td>21158 (30)</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>38547 (36)</td>
<td>17398 (48)</td>
<td>21149 (30)</td>
</tr>
</tbody>
</table>
Association of Prehospital Advanced Airway Management With Neurologic Outcome and Survival in Patients With Out-of-Hospital Cardiac Arrest
Association of Prehospital Advanced Airway Management With Neurologic Outcome and Survival in Patients With Out-of-Hospital Cardiac Arrest

praglottic airways (adjusted OR, 0.38; 95% CI, 0.36-0.40). In a propensity score-matched cohort (357,228 patients), the adjusted odds of neurologically favorable survival were significantly lower both for endotracheal intubation (adjusted OR, 0.45; 95% CI, 0.37-0.55) and for use of supraglottic airways (adjusted OR, 0.36; 95% CI, 0.33-0.39). Both endotracheal intubation and use of supraglottic airways were similarly associated with decreased odds of neurologically favorable survival.
Co říká EBM?
Introduction

The optimal approach to managing the airway during cardiac arrest has been unclear, and several recent observational studies have challenged the assumption that advanced airways are necessarily superior to basic airway techniques.
Community-Wide Cardiopulmonary Resuscitation

PETER SAFAR, M.D.
Pittsburgh, Pennsylvania

In the recent past there were about 90,000 accidental deaths per year, and 40,000 of those were due to highway accidents, in which injuries involving the head...
HEART-LUNG RESUSCITATION

I. FIRST AID: OXYGENATE THE BRAIN IMMEDIATELY

Airway — TILT HEAD BACK

Breathe — INFLATE LUNGS 3-5 TIMES.

Circulate — COMPRESSION HEART, 1 SECOND

II. START SPONTANEOUS CIRCULATION

Drugs — EPINEPHRINE: 1.0 mg (10 CC of 1:1000) I.V. OR 0.5 mg INTRAARTICULAR. SODIUM BICARBONATE: APPROXIMATELY 375 G/30 CC 1/2 Dose in Children I.V. E. K. G.: FIBRILLATION; EXTERNAL ELECTRIC DEFIBRILLATION; REPEAT SHOCK EVERY 1-5 MINUTES UNTIL FIBRILLATION STOPPED. IF ASYSTOLE OR WEAK BEATS: EPINEPHRINE OR CAFFEIN I.V.

Fluids — I.V. PLASMA, DEXTRAN, SALINE

III. SUPPORT RECOVERY

Gauge — EVALUATE AND TREAT CAUSE OF ARREST

Hypothermia — START WITHIN 10 MINUTES IF NO SIGNS OF CNS RECOVERY

Intensive Care — SUPPORT VENTILATION; TRACHEOTOMY, PROLONGED CONTROLLED VENTILATION, GASTRIC TRIBE AS NECESSARY;

CONTROL CONVULSIONS MONITOR

I.V. PLASMA, DEXTRAN, SALINE

Do not interrupt cardiac compressions and ventilation. Tracheal intubation only when necessary.

AFTER RETURN OF SPONTANEOUS CIRCULATION USE 

e.g. NOREPINEPHRINE (Levophed) I.V. DRIP

Figure 1. The A, B, C of emergency resuscitation. These instructions have been arranged for the heart and brain of a billfold card or for a poster which may be obtained from the Pennsylvania Heart Association or the Pennsylvania Department of Health, Harrisburg.
RCT ?
Hrušky a jablka

Supraglotické pomůcky
- iGel
- LMA
- ...

Intubace

Žádné pomůcky

Vzduchovod

Žádná ventilace

EMS Response time

Lékař

Paramedik

(Ne)zkušenost

...
Máme 5 domov, každý iné farby.
V každom dome býva človek inej národnosti.
Každý pije iný nápoj, fajčí iné cigarety a vlastní iné domáce zvierat.
EINSTEINOVA HÁDANKA

Tuto hádátku vymyslel údajně sám Albert Einstein a tvrdí, že 98% lidí ji nedokážu vyřešit. Patříte mezi 2% nejchytřejších lidí na světě?

**Fakta:**
- Je 5 domů, z nichž každý má jinou barvu.
- V každém domě žije jeden člověk, který pochází z jiného státu.
- Každý z majitelů pije nápoj, kouří jeden druh cigaret a chová jedno zvíře.
- Žádný z nich nepije stejný nápoj, nekouří stejný druh cigaret a nechová stejné zvíře.

**Nápověda:**
- Brit bydlí v červeném domě
- Švéd chová psa
- Dán pije čaj
- Zelený dům stojí hned nalevo od bílého
- Majitel zeleného domu pije kávu
- Ten, kdo kouří Pall Mall, chová ptáka
- Majitel žlutého domu kouří Dunhill
- Ten, kdo bydlí uprostřed řady domů, pije mléko
- Nor bydlí v prvním domě
- Ten, kdo kouří Blend, bydlí vedle toho, kdo chová kočku
- Ten, kdo chová koně, bydlí vedle toho, kdo kouří Dunhill
- Ten, kdo kouří Blue Master, pije pivo
- Němec kouří Prince
- Nor bydlí vedle modrého domu
- Ten, kdo kouří Blend, má sousedu, který pije vodu

Otvářka zní: Kdo chová rybičky?
Hrušky a jablka (a jahody a třešně..)

Randomizovaná studie nepravděpodobná..
Předpoklady benefitu intubace

• pacient s NZO potřebuje umělou ventilaci..
• vlastní proces intubace během KPR nepoškozuje pacienta..
• ventilace cestou ETR nepoškozuje pacienta..
Předpoklady benefitu intubace

• pacient s NZO potřebuje umělou ventilaci..?

• vlastní proces intubace během KPR nepoškozuje pacienta..

• ventilace cestou ETR nepoškozuje pacienta..
Potřebují klinicky mrtví dýchat?
Zvýšení celkového přežití z 3,7% na 9,8%.

Celkové přežití ve skupinách:
• no CPR: 5,2%
• klasická CPR: 7,8%
• CO-CPR: 13,3%

Závěry:
CO-CPR byla spojená s vyšším přežitím.

Je tedy možné zobecnit, že CO-CPR je lepší a měli bychom laiky učit pouze stlačovat hrudník?
Chest Compression–Only CPR by Lay Rescuers and Survival From Out-of-Hospital Cardiac Arrest

<table>
<thead>
<tr>
<th>Year</th>
<th>CPR</th>
<th>CO-CPR</th>
<th>Podíl resuscitovaných</th>
<th>Přežití CPC 1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>14%</td>
<td>14.5%</td>
<td>2.4%</td>
<td>3.9%</td>
</tr>
<tr>
<td>2006</td>
<td>52%</td>
<td>41%</td>
<td>5.5%</td>
<td>5.4%</td>
</tr>
<tr>
<td>2007</td>
<td>39%</td>
<td>39%</td>
<td>4.7%</td>
<td>3.9%</td>
</tr>
<tr>
<td>2008</td>
<td>42%</td>
<td>42%</td>
<td>4.2%</td>
<td>4.2%</td>
</tr>
<tr>
<td>2009</td>
<td>35%</td>
<td>35%</td>
<td>3.6%</td>
<td>3.6%</td>
</tr>
</tbody>
</table>
2. Can closed chest cardiac massage be relied upon to ventilate the lungs adequately? No. Previous studies of the role of airway obstruction in resuscitation and on the failure of chest-pressure artificial respiration seem to indicate that sternal pressure cannot be relied upon to produce adequate ventilation.\(^3\)\(^5\) Further studies were performed in 1960 to determine the ventilatory efficacy of the sternal pressure produced
2. Can closed chest cardiac massage be relied upon to ventilate the lungs adequately? No. Previous studies of the role of airway obstruction in resuscitation and on the failure of chest-pressure artificial respiration seem to indicate that sternal pressure cannot be relied upon to produce adequate ventilation.\textsuperscript{3-5} Further studies were performed in 1960 to determine the ventilatory efficacy of the sternal pressure produced
Předpoklady benefitu intubace

- pacient s NZO potřebuje umělou ventilaci..?
- vlastní proces intubace během KPR nepoškozuje pacienta..?
- ventilace cestou ETR nepoškozuje pacienta..?
• riziko intubace do jícnu
• přerušení kompresí hrudníku
• selhání intubace až 50% (zkušenost?)
• obtížné získání a udržení dovednosti
• riziko hyperventilace
• riziko hyperoxie post-ROSC

• ventilace bez nutnosti přerušit kompresí hrudníku
• efektivní ventilace
• minimalizace distenze žaludku / regurgitace / aspirace
• uvolnění rukou
TABLE 1. Clinical Observational Study: Maximum Ventilation Rate, Duration, and Percentage of Time in Which a Positive Pressure Was Recorded in the Lungs (Mean±SEM)

<table>
<thead>
<tr>
<th>Group</th>
<th>Ventilation Rate (Breaths per Minute)</th>
<th>Ventilation Duration (Seconds per Breath)</th>
<th>% Positive Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>$37\pm4^*$</td>
<td>$0.85\pm0.07^\dagger$</td>
<td>$50\pm4%$</td>
</tr>
<tr>
<td>Group 2</td>
<td>$22\pm3^*$</td>
<td>$1.18\pm0.06^\dagger$</td>
<td>$44.5\pm8.2%$</td>
</tr>
<tr>
<td>Group 3</td>
<td>$30\pm3.2$</td>
<td>$1.0\pm0.7$</td>
<td>$47.3\pm4.3%$</td>
</tr>
</tbody>
</table>

*P<0.05; †P<0.05; group 1, first 7 consecutive cases; group 2, subsequent 6 consecutive cases (after retraining); group 3, groups 1 and 2 combined.
<table>
<thead>
<tr>
<th></th>
<th>Ventilation Rate, Breaths per Minute</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hemodynamics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAP, mm Hg</td>
<td>68.8±4.7</td>
<td>62.7±4.2</td>
<td>60.1±3.6</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>CPP, mm Hg</td>
<td>23.4±1.0</td>
<td>19.5±1.8</td>
<td>16.9±1.8</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>MIP, mm Hg per minute</td>
<td>7.1±0.7</td>
<td>11.6±0.7</td>
<td>17.5±1.0</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td><strong>Arterial blood gases</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>7.34±0.02</td>
<td>7.45±0.03</td>
<td>7.52±0.03</td>
<td>0.0006</td>
<td></td>
</tr>
<tr>
<td>Paco₂, mm Hg</td>
<td>22.7±2.7</td>
<td>15.6±2.2</td>
<td>11.6±1.5</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Pao₂, mm Hg</td>
<td>340.9±40.7</td>
<td>403.3±47.0</td>
<td>403.7±48.0</td>
<td>0.59</td>
<td></td>
</tr>
</tbody>
</table>

SAP, Systolic aortic pressure; CPP, coronary perfusion pressure; MIP, mean intrathoracic pressure.
Hyperventilace

• zvyšuje nitrohrudní tlak..
• snižuje koronární perfuzní tlak..
• snižuje žilní návrat..
• způsobuje hypokapniı..
Hypokapnie
Hypokapnie a průtok krve mozkem
Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality

J. Hope Kilgannon, MD
Alan E. Jones, MD
Nathan I. Shapiro, MD, MPH
Mark G. Angelos, MD
Barry Milcarek, PhD
Krystal Hunter, MBA
Joseph E. Parrillo, MD
Stephen Trzeciak, MD, MPH
for the Emergency Medicine Shock Research Network (EMShockNet) Investigators

Context  Laboratory investigations suggest that exposure to hyperoxia after resuscitation from cardiac arrest may worsen anoxic brain injury; however, clinical data are lacking.

Objective  To test the hypothesis that postresuscitation hyperoxia is associated with increased mortality.

Design, Setting, and Patients  Multicenter cohort study using the Project IMPACT critical care database of intensive care units (ICUs) at 120 US hospitals between 2001 and 2005. Patient inclusion criteria were age older than 17 years, nontraumatic cardiac arrest, cardiopulmonary resuscitation within 24 hours prior to ICU arrival, and arterial blood gas analysis performed within 24 hours following ICU arrival. Patients were divided into 3 groups defined a priori based on PaO₂ on the first arterial blood gas values obtained in the ICU. Hyperoxia was defined as PaO₂ of 300 mm Hg or greater; hypoxia, PaO₂ of less than 60 mm Hg (or ratio of PaO₂ to fraction of inspired oxygen <300); and normoxia, not classified as hyperoxia or hypoxia.

Main Outcome Measure  In-hospital mortality.
Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality

**Table 4. Outcomes of Study Patients**

<table>
<thead>
<tr>
<th></th>
<th>All Patients (N = 6326)</th>
<th>Hypoxia (n = 3999)</th>
<th>Normoxia (n = 1171)</th>
<th>Hyperoxia (n = 1156)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital mortality, No. (%) [95% CI]</td>
<td>3561 (56) [55-58]</td>
<td>2297 (57) [56-59]</td>
<td>532 (45) [43-48]</td>
<td>732 (63) [60-66]</td>
</tr>
<tr>
<td>Survivors, No. (%)</td>
<td>2765 (44)</td>
<td>1702 (43)</td>
<td>639 (55)</td>
<td>424 (37)</td>
</tr>
<tr>
<td>Independent functional status at hospital discharge, No. (%) [95% CI]</td>
<td>939 (34) [32-36]</td>
<td>570 (33) [31-36]</td>
<td>245 (38) [35-42]</td>
<td>124 (29) [25-34]</td>
</tr>
</tbody>
</table>

*JAMA. 2010;303(21):2165-2171*
Part 4: Advanced life support
2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

Introduction

The optimal approach to managing the airway during cardiac arrest has been unclear, and several recent observational studies have challenged the assumption that advanced airways are necessarily superior to basic airway techniques.
Part 4: Advanced life support
2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations

* We suggest using either an advanced airway or a bag-mask device for airway management during CPR (weak recommendation, very-low-quality evidence) for cardiac arrest in any setting.
Dopady do praxe..?
Dopady do praxe..?

Intubace během resuscitace ANO, ale:

• rychle
• správně
• nehyperventilovat !!!
• vyvarovat se hyperoxemii post-ROSC.