Scand J Trauma Resusc Emerg Med 2004; **12** ; 173-175 With editorial comments Tom Silfvast

Mort TC

Emergency tracheal intubation: complications associated with repeated laryngoscopic attempts

Anesth Analg 2004; **99**: 607-613

Repeated conventional tracheal intubation attempts may contribute to patient morbidity. Critically-ill patients (n = 2833) suffering from cardiovascular, pulmonary, metabolic, neurologic, or trauma-related deterioration were entered into an emergency intubation quality improvement database. This practice analysis was evaluated for airway and hemodynamic-related complications based on a set of defined variables that were correlated to the number of attempts required to successfully intubate the trachea outside the operating room. There was a significant increase in the rate of airway-related complications as the number of laryngoscopic attempts increased (</=2 versus >2 attempts): hypoxemia (11.8% versus 70%), regurgitation of gastric contents (1.9% versus 22%), aspiration of gastric contents (0.8% versus 13%) bradycardia (1.6% versus 21%), and cardiac arrest (0.7% versus 11%; P < 0.001). Although predictable, this analysis provides data that confirm the number of laryngoscopic attempts is associated with the incidence of airway and hemodynamic adverse events. These data support the recommendation of the ASA Task Force on the Management of the Difficult Airway to limit laryngoscopic attempts to three in lieu of the considerable patient injury that may occur.

***Comments**: Although this paper describes in-hospital patients it is thoughtful reading for everybody who deals with intubation of emergency patients. The issues and risks of managing the airway are similar irrespective of the location of the patient. The authors analysed data of more than 2800 patients who required emergency airway management for all causes except cardiac arrest during a 10-year period. The assumption was that the more intubation attempts were needed, the more problems would occur. And indeed, patients requiring more than two intubation attempts developed more often hypoxaemia, had more often regurgitation of gastric contents, and experienced bardycardic episodes and even cardiac arrest than the patients who were successfully intubated on the first or second attempt. Of importance is that these patients were treated by physicians trained in anaesthesia. Especially non-physician prehospital care providers usually have great difficulties in maintaining intubating skills because of the infrequent number of patients needing this intevention. It seems very wise to carefully evaluate the indications for repeated intubation attempts if oxygenation and ventilation can be maintained using bag-valve mask ventilation or alternative airway devices.*

Cooper DJ, Myles PS, McDermott FT, Murray LJ, Laidlaw J, Cooper G, Tremayne AB, Bernard SS, Ponsford J; HTS Study Investigators.

Prehospital hypertonic saline resuscitation of patients with hypotension and severe traumatic brain injury: a randomized controlled trial

JAMA 2004; **291**: 1350-1357

Context: Prehospital hypertonic saline (HTS) resuscitation of patients with traumatic brain injury (TBI) may increase survival but whether HTS improves neurological outcomes is unknown.

Objective: To determine whether prehospital resuscitation with intravenous HTS improves long-term neurological outcome in patients with severe TBI compared with resuscitation with conventional fluids.

Design, setting and patients: Double-blind, randomized controlled trial of 229 patients with TBI who were comatose (Glasgow Coma Scale score, <9) and hypotensive (systolic blood pressure, <100 mm Hg). The patients were enrolled between December 14, 1998, and April 9, 2002, in Melbourne, Australia.

Interventions: Patients were randomly assigned to receive a rapid intravenous infusion of either 250 mL of 7.5% saline (n = 114) or 250 mL of Ringer's lactate solution (n = 115; controls) in addition to conventional intravenous fluid and resuscitation protocols administered by paramedics. Treatment allocation was concealed.

Main outcome measure: Neurological function at 6 months, measured by the extended Glasgow Outcome Score (GOSE).

Results: Primary outcomes were obtained in 226 (99%) of 229 patients enrolled. Baseline characteristics of the groups were equivalent. At hospital admission, the mean serum sodium level was 149 mEq/L for HTS patients vs 141 mEq/L for controls (P<.001). The proportion of patients surviving to hospital discharge was similar in both groups (n = 63 (55%) for

HTS group and n = 57 (50%) for controls; P =.32); at 6 months, survival rates were n = 62 (55%) in the HTS group and n = 53 (47%) in the control group (P =.23). At 6 months, the median (interquartile range) GOSE was 5 (3-6) in the HTS group vs 5 (5-6) in the control group (P =.45). There was no significant difference between the groups in favorable outcomes (moderate disability and good outcome survivors (GOSE of 5-8)) (risk ratio, 0.99; 95% confidence interval, 0.76-1.30; P =.96) or in any other measure of postinjury neurological function.

Conclusion: In this study, patients with hypotension and severe TBI who received prehospital resuscitation with HTS had almost identical neurological function 6 months after injury as patients who received conventional fluid.

***Comments**: Especially in brain injured patients, both hypoxaemia and hypotension are associated with bad outcome, and the main goal of initial treatment is to avoid these complications. The beneficial effects of solutions containing hypertonic saline (HS) on haemodynamics have been well documented, but solid proof that this effect also affects outcome has not been presented. Despite this, HS has been recommended in the treatment of brain injured patients. In this very well conducted study from Australia, 229 hypotensive prehospital patients with brain injury were randomly allocated to receive 250 ml HS and conventional treatment or just conventional treatment without HS. The purpose was to see if HS as part of the fluid resuscitation protocol improved neurological outcome. The study was powered to detect, with an 80 % probability, a 20 % improvement in the extended Glasgow Outcome Score (GOSE) at 6 months after the injury. Somewhat disappointingly, the patients in both the HS group and the conventionally treated had a similar outcome. This was true also in two patient groups defined beforehand to be analysed separately, namely patients with long transportation delays and patients with severe (GCS 5 – 8) but not extremely severe (GCS < 5) brain trauma. Patients with long transport delays may benefit more from an early correction of hypotension using HS, and patients with very severe brain trauma may not survive at all whatever the treatment is. The study has been criticised for also including patients without isolated head trauma, such as multitrauma. The prognosis of multitrauma patients may be different from that of patients with brain trauma only, and therefore the study was not powered to measure the effect of HS on pure brain trauma. On the other hand, administration of HS was not associated with harmful side-effects in this patient population, and HS remains an option in the treatment of hypotensive patients until further evidence is presented.*

Stiell IG, Wells GA, Field B, Spaite DW, Nesbitt LP, De Maio VJ, Nichol G, Cousineau D, Blackburn J, Munkley D, Luinstra-Toohey L, Campeau T, Dagnone E, Lyver M; Ontario Prehospital Advanced Life Support Study Group

Advanced cardiac life support in out-of-hospital cardiac arrest

NEJM 2004; **351**: 647-656

Background: The Ontario Prehospital Advanced Life Support (OPALS) Study tested the incremental effect on the rate of survival after out-of-hospital cardiac arrest of adding a program of advanced life support to a program of rapid defibrillation. **Methods**: This multicenter, controlled clinical trial was conducted in 17 cities before and after advanced-life-support programs were instituted and enrolled 5638 patients who had had cardiac arrest outside the hospital. Of those patients, 1391 were enrolled during the rapid-defibrillation phase and 4247 during the subsequent advanced-life-support phase. Paramedics were trained in standard advanced life support, which includes endotracheal intubation and the administration of intravenous drugs.

Results: From the rapid-defibrillation phase to the advanced-life-support phase, the rate of admission to a hospital increased significantly (10.9 percent vs. 14.6 percent, P<0.001), but the rate of survival to hospital discharge did not (5.0 percent vs. 5.1 percent, P=0.83). The multivariate odds ratio for survival after advanced life support was 1.1 (95 percent confidence interval, 0.8 to 1.5); after an arrest witnessed by a bystander, 4.4 (95 percent confidence interval, 3.1 to 6.4); after cardiopulmonary resuscitation administered by a bystander, 3.7 (95 percent confidence interval, 2.5 to 5.4); and after rapid defibrillation, 3.4 (95 percent confidence interval, 1.4 to 8.4). There was no improvement in the rate of survival with the use of advanced life support in any subgroup.

Conclusion: The addition of advanced-life-support interventions did not improve the rate of survival after out-of-hospital cardiac arrest in a previously optimized emergency-medical-services system of rapid defibrillation. In order to save lives, health care planners should make cardiopulmonary resuscitation by citizens and rapid-defibrillation responses a priority for the resources of emergency-medical-services systems. Copyright 2004 Massachusetts Medical Society

***Comments**: The fourth link (advanced life support) in the "chain of survival" concept in cardiac arrest – early access, early CPR, early defibrillation and early advanced life support – is heavily challenged in this recent huge study from Canada. The OPALS study group (Ontario Prehospital Advanced Life Support) has so far generated a wealth of data concerning the management of prehospital cardiac arrest on a community basis. Previously they have verified that links one, two and three in the chain of survival really affect the chances of survival. Now, according to their data, it seems that we can forget link number four;*

if return of spontaneous circulation in cardiac arrest is not achieved with rapidly initiated basic CPR and defibrillation of ventricular fibrillation, there is no help of epinephrine or other drugs, or of intubating the patient. In Ontario, Canada, 17 urban communities with an existing rapid defibrillation program (call to arrival of crew with defibrillator < 8 min) added a paramedic level to their EMS systems which until then had only provided basic life support and defibrillation. The paramedics were trained to intubate, start iv-infusions and administer a variety of intravenous drugs according to ACLS protocols and had to arrive within 11 min from the call. The investigators then studied the effect on outcome from prehospital cardiac arrest before and after the institution of the paramedics and found that the addition advanced life support capacity had no effect on outcome. All of us have treated cardiac arrest patients and have experienced patients that we believe have regained spontaneous circulation after intubation and the administration of epinephrine or some other drug. However, these have been subjective feelings, and no large scale studies have been performed. Although very convincing, there are some questions related to this study. First, it was a before-after study, which is not as reliable as a randomised trial. However, performing a randomised study with this objective may ethically be regarded as questionable. Second, outcome from ventricular fibrillation was only 13 % during both periods. Considering the relatively short delays for defibrillation the rate is surprisingly low compared with many other reports. Third, it is not clear whether the existing EMTs were trained to be paramedics, or if a second paramedic tier was introduced. The results may be different in a one-tier system and a two-tiered system. Fourth, during the paramedic period more patients received CPR by firefighters and were defibrillated by first responders compared to the previous period. And last, the factors involving the emerging fifth link in the chain of survival - post-resuscitation care - were not controlled for, and we know today that the way we treat patients after ROSC plays an important role on survival. Despite these comments, it is easy to agree with the authors' conclusions that the basics in an EMS should be addressed first before investing in expensive paramedic programs. Early access, rapidly instituted CPR and early defibrillation are the most important factors affecting survival.
