WILL USING LARYNGEAL TUBES RATHER THAN ENDOTRACHEAL INTUBATION SAVE LIVES?

A groundbreaking study indicates that laryngeal tube insertion improves 72-hour survival in adults, compared to endotracheal insertion

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The fast provision of emergency oxygen to adult patients who have suffered sudden cardiac arrest is recognized as an effective way to improve 72-hour survival rates.

However, much debate has occurred as to the safest, fastest, and most reliable way to administer this care. Is the common practice of endotracheal intubation (ETI) by EMS the best way to provide patients with life-saving oxygen? Or is a simpler alternative such as laryngeal tube insertion (LT)—which doesn't have the same finesse requirements and complications associated with ETI—a better option for EMS and their sudden cardiac arrest patients?

To put this debate into an objectively tested scientific context, a research team led by Dr. Henry Wang (a professor at McGovern Medical School at the University of Texas Health Science Center in Houston) conducted a randomized clinical study to compare the effectiveness of initial LT insertion vs. initial ETI insertion in adults with out-of-hospital cardiac arrest (OHCA).

Published by the *Journal of the American Medical Association* (*JAMA*) in its August 28, 2018 edition (Volume 320, No. 8), the study is titled "Effect of a Strategy of Initial Laryngeal Tube Insertion vs. Endotracheal Intubation on 72-Hour Survival in Adults With Out-of-Hospital Cardiac Arrest."

This study concluded that "Among adults with OHCA, a strategy of initial LT insertion was associated with significantly greater 72-hour survival compared with a strategy of initial ETI. These findings suggest that LT insertion may be considered as an initial airway management strategy in patients with OHCA, but limitations of the pragmatic design, practice setting, and ETI performance characteristics suggest that further research is warranted."

Of course, a study is only as good as its methodology, its sample size and statistical resemblance to the overall population being considered, and the rigor of its analysis. This is why Dr. Wang's study is worthy of careful consideration due to its significant conclusions. If this study passes muster, then its statement that initial LT insertion leads to "significantly greater 72-hour survival" than initial ETI is one that EMS agencies of all sizes need to pay attention to, and adjust their procedures in line with.

Specifically, the 72-hour survival rate for OHCA patients receiving LT from EMS was 18.3%, vs. a 15.4% survival rate for those patients who received ETI from EMS. As Dr. Wang's study noted, this is "a significant difference."

Study Parameters

Dr. Wang's cluster-crossover randomized clinical trial occurred between Dec. 1, 2015 and Nov. 4, 2017, with a final followup date of Nov. 10, 2017. Using patient data collected by 27 EMS agencies belonging to the Resuscitation Outcomes Scenario, the trial drew on a pool of 3004 EMS OHCA patients. Their median age was 64 years, with a group age range of 75-76 years.

The study was funded by a National Heart, Lung, and Blood Institute (NHLBI) grant, which supports large-scale, low-cost pragmatic clinical trials. A trial-appointed study group monitored EMS agency and regional center protocol compliance and data reporting. An NHLBI-appointed data and safety monitoring committee oversaw the trial from start to finish.

The Resuscitation Outcomes Consortium is funded by the NHLBI to conduct

clinical research into OCA and major trauma therapies. The University of Alabama at Birmingham was the study's clinical coordinating center, while data coordination was handled by the University of Washington Clinical Trials Center.

The study randomized which of the two approaches (LT and ETI) that the EMS agencies used to ventilate OHCA patients. The protocol did not specify how many attempts per patient EMS crews could make using either LT or ETI.

Under the cluster-randomized crossover approach, each participating agency was directed to use either LT or ETI for a specific time period (3–5 months) for all of their OHCA patients, before switching to the other method. Randomizing the study on this group basis, rather than on a per-patient basis, made data collection/reporting easier and more reliable. Meanwhile, the sheer size of the sample—3004 agencies across 27 agencies—ensured that conclusions based on the collected results would be statistically reliable.

Measured Outcomes

There were a number of clinical outcomes measured by this study, in comparing the EMS performance of LT and ETI therapies for OHCA patients.

The primary outcome to be measured was survival by each OHCA patient to 72 hours after cardiac arrest. This data was derived either from hospital records, or EMS records when the patient was subsequently resuscitated in the field (or died there). Dr. Wang's team chose this outcome because it required a smaller sample size than traditional metrics such as survival to hospital discharge.

Secondary outcomes measured by this LT vs. ETI study included:

- return of spontaneous blood circulation in the OHCA patient;
- survival to hospital discharge;
- favorable neurological status upon hospital discharge, based on a patient's Modified Rankin Scale score of 3 or less.

For the record, the LT vs. LTI secondary outcomes were as follows:

- Return of spontaneous blood circulation in the OHCA patient: 27.9% LT vs. 24.3% ETI (adjusted difference, 2.9% [95% CI, 0.2%–5.6%]; P = .04).

- Survival to hospital discharge: 10.8% LT vs. 8.1% ETI (adjusted difference, 3.6% [95% CI, 0.3%–6.8%]; P = .03).
- Favorable neurological status upon hospital discharge: 7.1% LT vs. 5.0% ETI (adjusted difference, 2.1% [95% CI, 0.3%–3.8%]; P = .02).

According to the study, "There were no significant differences in oropharyngeal or hypopharyngeal injury (0.2% vs. 0.3%), airway swelling (1.1% vs. 1.0%), or pneumonia or pneumonitis (26.1% vs. 22.3%)."

Details in the Data

When Dr. Wang's study was concluded, 1505 of the 3004 patients were shown to have received initial LT therapy in the field. The other 1499 received ETI instead.

The fact that the study split almost 50/50 across the two test options indicated the wisdom of using the cluster-randomized crossover approach.

As noted above—but worth restating for the purposes of analysis—the 72-hour survival rate among LT patients was 18.3%, vs. 15.4% in the ETI group. Again, this is for initial application of the two selected therapies. Digging down into the results, we find the following.

In the 1505 patients assigned to the initial LT group:

- 1285 received LT;
- 152 subsequently received BVM (mag mask ventilation);
- 67 subsequently received ETI;
- 1 received an unknown airway therapy.

In the 1499 patients assigned to the ETI group:

- 1160 received ETI;
- 200 subsequently received BVM (mag mask ventilation);
- 138 subsequently received LT;
- 1 received an unknown airway therapy.

According to the study as published in *JAMA*, patients in the ETI group were more likely to experience 3 or more airway insertion attempts compared to LT (18.9% vs. 4.5%).

Unrecognized airway dislodgement or misplacement was higher for ETI vs. LT (44.1% vs. 11.8%).

Inadequate patient ventilation was reported by EMS personnel for LT more than ETI (1.8% vs. 0.6%).

Pneumothoraces (7.0% vs. 3.5%)

and rib fractures (7.0% vs. 3.35) happened more often with ETI than with LT. "There were no significant differences in oropharyngeal or hypopharyngeal injury (0.2% vs. 0.3%), airway swelling (1.1% vs. 1.0%), or pneumonia or pneumonitis (26.1% vs. 22.3%) in the LT vs. ETI groups," said the study.

Understanding the Results

The results of Dr. Wang's study clearly indicate that initial treatment of OHCA patients using LT is a more effective form of treatment than ETI; at least based on the 72-hours survival rate outcome.

This said, the success rate for both methods—18.3% for LT vs. 15.4% ETI—still indicates that the vast majority of OHCA patients do not make it to the 72-hour survival threshold. So although the LT option has been shown to be an improvement in emergency treatment, much more needs to be done to boost the 72-hour survival rate in this patient group.

As well, Dr. Wang's study takes pains to point out that "The trial demonstrated the effectiveness of an LT-based strategy of advanced airway management, not the efficacy of the LT airway device." This strategy includes coordinating multiple interventions when treating OHCA patients, including the initiation and maintenance of chest compressions, controlled ventilation, vascular access, the administration of appropriate medications, and defibrillation.

Two factors worth noting: The elapsed time from EMS arrival to first airway attempt was 2.7 minutes shorter in the LT group than it was for the ETI group. As well, "LT required fewer insertion attempts than ETI," said the study.

Dr. Wang's study also noted the following shortcomings in its approach:

- The study evaluated LT and ETI under existing clinical protocols and educational practices, without any additional training being provided to EMS crews.
- The grant award limited the sample size for the study. (Perhaps having more subjects might have revealed different results.)
- The study "could not assess the influence of chest compression or ventilation quality" on outcomes.
- The study only focused on LT and not other alternatives to ETI.

This said, the final words of this study's conclusions bear repeating: "Among adults with OHCA, a strategy of initial LT insertion was associated with significantly greater 72-hour survival compared with a strategy of initial ETI. These findings suggest that LT insertion may be considered as an initial airway management strategy in patients with OHCA, but limitations of the pragmatic design, practice setting, and ETI performance characteristics suggest that further research is warranted."

For EMS agencies wanting to improve their OHCA patient care, LT is an option that they should consider adding to their emergency treatment medical kits.

King LT Provides Superior Outcomes Compared to Intubation in OHCA

Results of the Pragmatic Airway Resuscitation Trial show the Ambu® King LTS-D™ laryngeal tube (LT) to be safer and produce better outcomes than the gold standard of endotracheal intubation (ETI) in out-of-hospital cardiac arrest (OHCA)[1]

"Use of the newer LT devices could result in more than 10,000 additional lives saved each year."

—Henry E. Wang, M.D., M.S., lead author of the study

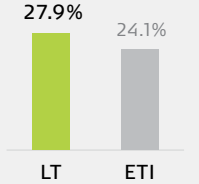
NEGLIGABLE DIFFERENCE

Oropharyngeal or Hypopharyngeal Injury and Airway Swelling or Edema

Nearly identical results (0.1% difference) for LT and ETI

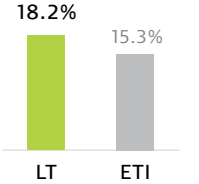
SUPERIOR OUTCOMES

Return of Spontaneous Circulation (ROSC)



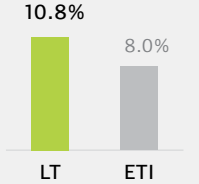
SUPERIOR OUTCOMES

72-HOUR SURVIVAL



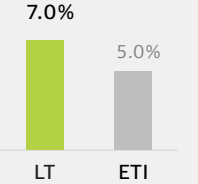
SUPERIOR OUTCOMES

Survival to Discharge



SUPERIOR OUTCOMES

Favorable Neurological Status at Discharge



[1]Funded by the National Heart, Lung, and Blood Institute (NHLBI), the Pragmatic Airway Resuscitation Trial includes data from more than 3,000 patients and is the largest of its kind to test oxygen delivery methods used by firefighters, emergency medical technicians and paramedics. The study was presented at the 2018 Society for Academic Emergency Medicine meeting in Indianapolis, Indiana by lead author Henry E. Wang, M.D., M.S., professor and vice chair for research in the Department of Emergency Medicine at McGovern Medical School at The University of Texas Health Science Center at Houston (UTHealth).

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