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Does endotracheal administration of adrenaline (epinephrine) work?

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Comments

Most international guidelines, including those from ILCOR1 (International Liaison Committee on Resuscitation), recommend endotracheal administration of adrenaline in cardiac arrest, when an intravenous (IV) route is not available. This is based on work done on animals and on single observations in humans, particularly neonates. Recently there has been controversy over this, with investigators claiming that adrenaline administered via an endotracheal tube (ET) does not work (see additional comments below). This study addresses the issue of average dosing requirements and compares the efficacy of the two routes (IV vs ET). The results suggest that there is a role for ET administration of adrenaline; however, it appears that there is a significant time lag following ET administration. The average doses used in this study, although within the limits as prescribed by the guidelines, are higher than in the previous studies. It is important to bear in mind that the individuals in the study were hypotensive, but were not in a cardiac arrest situation. This is a small non-randomized study and provides only circumstantial evidence that ET administration of adrenaline works.

Introduction

To assess the efficacy of endotracheal administration of adrenaline (epinephrine) in humans.

Methods

- Prospective randomized trial involving 34 anesthetized patients (5 women, 29 men) receiving an implantable cardio-verter defibrillator.

- After intubation, when mean arterial pressure (MAP) fell below 80 mmHg (after adequate fluid loading), IV adrenaline was injected via central line, at a dose of 1 µg/kg, with dose escalation to achieve the required MAP.
- Once the IV dose was established, the next time they were hypotensive, 100 times the IV dose was administered diluted in 10 ml of saline and administered slowly over 5 seconds into the airways, followed by 10 forced ventilations.
- There were two subgroups: one group received adrenaline directly into the ET (n = 17), and the other received adrenaline via a bronchial catheter wedged into a bronchus (laced under radiological guidance) (n = 17).
- The patients' clinical characteristics apparently did not differ between groups (data not shown).
- Mean dose of adrenaline ± SD = 1.3 ± 0.6 mg (range, 0.7 to 3 µg)
- Plasma catecholamine samples were collected from the second lumen of the central intravenous line immediately before adrenaline administration; 0.5, 2, 3, and 5 min after IV administration; and 0.5, 2, 3, 5, 10, and 20 min after ET administration.

Results

Airway administration of adrenaline significantly increased plasma adrenaline levels more than 200-fold, from 0.26 ± 0.21 nmol/l (range, 0.05 to 0.71 nmol/l) to 57.9 ± 56.8 nmol/l (range, 8.2 to 205.8 nmol/l) ($P = 0.0015$). MAP increased by almost 100% ($P < 0.001$), and heart rate increased from 64.0 ± 12.6 beats/min (range, 40 to 100 beats/min) to a maximum of 79.7 ± 20.5 beats/min (range, 50-140 beats/min). A delayed response was seen when adrenaline was administered through the airways. Mean time to first response in MAP of >10 mmHg, via the IV route, was 25.1 ± 15.1 seconds (SD 3.6-79.2) and via the ET route 64.0 ± 68.5 seconds (SD 8.4-279.6), $P < 0.001$. Mean time to reach the peak effect on MAP in seconds via IV route was 82.3 ± 31.0 (SD 11-131) and via the ET route was 219.8 ± 136.2 (SD 62-528), $P < 0.001$. There was no statistical difference between the two airway subgroups. ET administration of adrenaline appears as effective as IV; however, a time lag was seen and peripheral bronchial administration of adrenaline through a catheter (which is cumbersome and time-consuming) seems unnecessary.

Additional information

1. The universal advanced life support algorithm: an advisory statement from the Advanced Life Support Working Group of the International Liaison Committee on Resuscitation. (Kloeck W *et al*, *Circulation* 1997, **95**:2180-2182)

2. Endotracheal versus intravenous epinephrine during electromechanical dissociation with CPR in dogs. (Ralston *et al*, *Ann Emerg Med* 1985, **14**:1044-1048).
3. Comparison of endotracheal and peripheral intravenous adrenaline in cardiac arrest. Is the endotracheal route reliable? (Quinton *et al*, *Lancet* 1987, **1**:828-829).
4. Haemodynamic effects of tracheal compared with intravenous adrenaline (McCrirrick *et al*, *Lancet* 1992, **340**:868-870).
5. Comparison of i.v. and intra-tracheal administration of adrenaline (McCrirrick *et al*, *Br J Anaesth* 1994, **72**:529-532)

References

1. Raymondos K, Panning B, Leuwer M, Brechelt G, Korte T, Niehaus M, Tebbenjohanns J, Piepenbrock S: Absorption and hemodynamic effects of airway administration of adrenaline in patients with severe cardiac disease. *Ann Intern Med*. 2000, 132: 800-803.