Impairment of carotid artery blood flow by supraglottic airway use in a swine model of cardiac arrest

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Rationale

- Supraglottic airway devices (SGDs) are often used as an alternative to endotracheal tubes (ETT) during CPR.
- SGDs can be inserted ‘blindly’ and rapidly, without stopping compressions.
- These devices utilize pressurized balloons that direct air into the lungs and prevent esophagus insufflation.
- However, those balloons could compress carotids arteries and decrease carotid blood flow (CBF) during CPR in pigs.

Objectives

- The main aim of our study was to analyze the effect of the 3 most commonly used SGDs (LMA Flexible™, King LTS-D™, Combitube™) on carotid flow during CPR in pigs.
- The secondary aim was to confirm the direct compression on the carotid arteries by the SGD by post mortem arteriography.
Materials and Methods

- **Swine model of cardiac arrest**: 9 pigs of 32±1 kg.
- SGD order was randomized.
- **Parameters**:
  - Mean carotid blood flow
  - Balloon Pressure, aortic and right atrial pressure, ETCO₂ (mmHg)
  - Arteriography with SGDs in position
- **Statistical analysis**:
  - Wilcoxon rank test
  - A p value <0.05 was considered statistically significant

Results

- **Decrease in mean CBF**: LMA (-43 ± 11%) King (-46 ± 6%) Combitube (-72 ± 10%) (p < 0.05)
- **Hemodynamic curve example**:

Results

- **Pressures (mmHg) inside SGD balloons were**:
  - King : 43 ± 2; LMA : 35 ± 2; Combitube > 86
- **Arteriography** showed that SGDs directly compress carotid arteries
The use of 3 SGDs significantly reduce CBF by direct compression of carotid arteries. Pressure levels found inside the balloons of SGDs can explain the results. Although there are anatomical differences between pigs and humans, the anatomical relationship between the airway and carotid arteries are the same.

Discussion

- Though recommended for use, SGDs may have potential unanticipated harmful consequences during CPR.
- While limited to pigs, these findings suggest that SGD use during CPR may substantially reduce blood flow to the brain.
- Further studies, including a study in humans, are underway.