Title : PREVENTION OF ARTERIAL OXYGEN DESATURATION INDUCED BY ENDOTRACHEAL SUCTIONING USING CONSTANT FLOW INSUFFLATION.

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In mechanically ventilated patients, endotracheal suctioning can lead to major arterial oxygen desaturation and produce adverse effects such as cardiac arrhytmia, cardiovascular collapse and even sudden death (1). Several mechanisms probably participate to suctioning-induced desaturation, including decrease in inspired oxygen fraction (FiO_2), apnea, mixed venous desaturation and reduction of lung volume. We describe here the use of a modified endotracheal tube of standard size, allowing delivery of a constant flow insufflation of oxygen (CFI) during endotracheal suctioning as a mean to prevent arterial desaturation.

MATERIALS AND METHODS

PATIENTS. Five patients ventilated for various disorders were included in the study (mean age ± SD = 57 ± 8 yrs). Three patients were ventilated for pneumonia (FiO_2 level of 0.5, PEEP level of 5 and 8 cm H_2O in 2 pts), whereas two patients were ventilated for neurologic disorders (FiO_2 level of 0.4).

PROTOCOL. All patients were intubated with an endotracheal tube of standard size (ID 8 mm) in the wall of which five capillaries (ID 700 µ) have been molded by extrusion (Porges Laboratories France). During disconnection from the ventilator, oxygen (12 $l.min^{-1}$) was delivered via these capillaries. Such gas injection creates a positive pressure of about 10 cm H_2O down the tube due to the air entrainment mechanism (2). Endotracheal suctioning was thus performed during two periods of 1 min in a randomized order, either with CFI, either without (standard).

The following parameters were measured : arterial blood gas before and immediately after suctioning; maximal changes in arterial saturation (ΔSO_2 max) and time of recovery after the end of suctioning (tSO_2), recorded from a pulse oxymeter; endotracheal pressure (Ptrach) and transpulmonary pressure (PTP, tracheal minus esophageal pressure); lung compliance before and 1 min after the end of suctioning.

RESULTS. Arterial oxygen desaturation was considerably reduced during CFI-suctioning by comparison to the standard suctioning, as shown in Fig. 1. ΔSO_2 max was -14.2 ± 8.5 during standard vs -0.2 ± 7.2 during CFI ($p<0.05$) ; tSO_2 was 227 ± 133 sec during standard and only 36 ± 50 sec during CFI ($p<0.05$). Immediately after suctioning PaO_2 fell by 20 ± 24 mmHg during standard but rose by 47 ± 47 mmHg during CFI ($p<0.01$). No significant change in $PaCO_2$ was observed. Modifications of PTP were clearly different between the two periods (-8 ± 7 cm H_2O during standard vs +5 ± 7 during CFI, $p<0.05$). After standard, Cdyn fell from 65 ± 29 to 59 ± 25 ml/cm H_2O but inversely rose from 64 ± 31 to 71 ± 35 ml/cm H_2O during CFI.

DISCUSSION. This study demonstrates that the use of constant flow insufflation can efficiently prevent arterial oxygen desaturation induced by endotracheal suctioning. This method is applicable routinely with the modified endotracheal tube. In addition, results of PTP and Cdyn suggest that a reduction in lung volume occurs during standard endotracheal suctioning, whereas lung volume is maintained or increased during CFI.

REFERENCES

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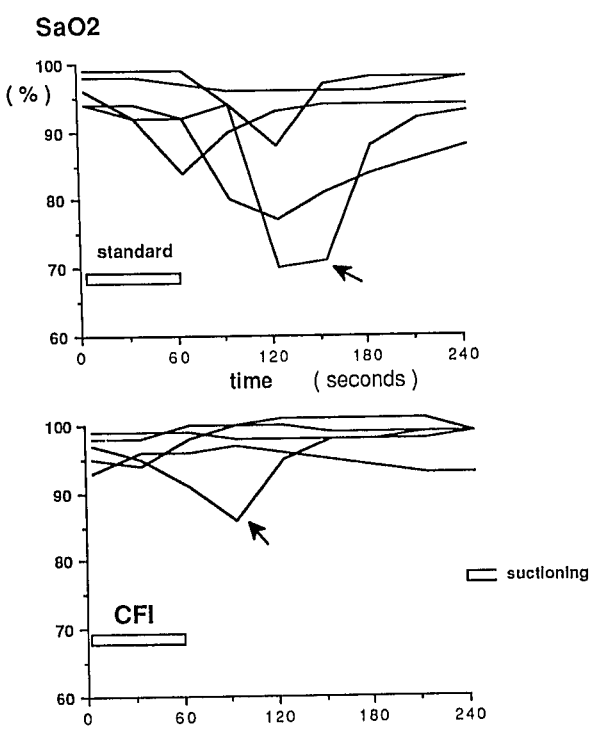

Fig. 1 : Changes in SaO_2 over time during standard endotracheal suctioning (upper panel) or with CFI (lower panel). The curves indicated by an arrow pertain to the same patient.

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