



ABSENT END-TIDAL CARBON DIOXIDE TRACE: A CASE OF MISPLACED TUBES

Karen Ruby Lionel

M.D., DM Associate Professor, Department of Anesthesiology, Christian Medical College, Vellore, India.

Ajay Prasad Hrishi P*

M.D., D.M., Assistant Professor, Neuroanesthesia division, Department of Anesthesiology, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, India. *Corresponding Author

ABSTRACT

Absence of end tidal carbon dioxide waveform after intubation is a manifestation of a misplaced airway securing device. We report a case of absent end tidal carbon dioxide (EtCO₂) trace associated with a normal end tidal oxygen (EtO₂) trace after intubation due to erroneous connection of the gas sampling catheter. The erroneous attachment of the sampling tube is often missed as the ports are situated adjacent to each other. Many a times, the anesthesiologist will identify this, and attribute it to faulty equipment and will immediately replace/send the monitor for rectification. A systematic interpretation of the waveform and displayed values is necessary along with careful inspection of the equipment before concluding that the monitor is faulty.

KEYWORDS : End Tidal Carbon Dioxide; Artifact; Faulty Connection

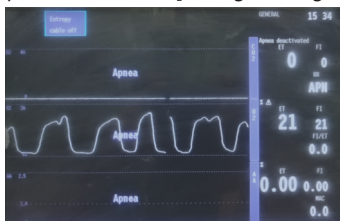
Introduction:

Absence of end tidal carbon dioxide waveform after intubation is a manifestation of a misplaced airway securing device. We report a case of absent end tidal carbon dioxide (EtCO₂) trace associated with a normal end tidal oxygen (EtO₂) trace after intubation due to faulty connection of the gas sampling catheter.

Case Report:

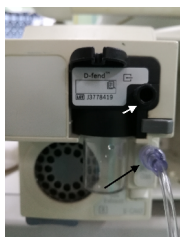
A 22-year-old gentleman scheduled for neurosurgery in supine position underwent standard monitoring, anesthetic induction and maintenance. Post intubation the apnea alarm was triggered in the EtCO₂ monitor with absence of EtCO₂ trace which prompted us to check for an erroneous esophageal intubation or accidental extubation. There was bilateral equal air entry in all lung fields on five-point auscultation, expiratory and inspiratory tidal volumes were equal and patient was hemodynamically stable. We ruled out any leak in the circuit and confirmed the endotracheal tube position with repeat laryngoscopy. We evaluated the gas monitor and found that the EtO₂ trace was present with absent EtCO₂ trace and anesthesia gas waveform. [Figure 1]

Figure 1: Gas monitor showing absent EtCO₂ and anesthetic gas tracings with apnea alarm and EtO₂ tracing showing FiO₂, EtO₂ as 21.



A systematic check of the gas monitor revealed that the side stream gas sampling catheter from the circuit had been attached to the reference gas port of the gas monitor. [Figure 2]

Figure 2: Gas monitor with the sampling catheter connected to the reference gas port (Black arrow) instead of the sampling port (White arrow).



The erroneous connection of the sampling catheter happened when the anesthesia technician reconnected the sampling catheter which had got disconnected during the induction phase, resulting in the absence of end tidal carbon dioxide and anesthetic gas waveform. The end tidal oxygen and the waveform was present with EtO₂ and FiO₂ showing 21% as the atmospheric air was being sampled and analyzed due to the negative pressure/suction generated by the gas monitoring device to draw the circuit gases for sampling.

Discussion

The apnea alarm in the intraoperative setting is dealt with as an anesthetic emergency. The absence of EtCO₂ waveform triggers a prompt response from the attending anesthesiologist. The usual causes being circuit disconnection, accidental extubation, blockage, kink or disconnection of the gas sampling tubing.¹ In all these scenarios both EtO₂ and EtCO₂ is absent but the presence of EtO₂ trace with the absence of EtCO₂ can be a baffling situation to the anesthesiologist. The gas monitoring cell aspirates the gas in the breathing circuit through the sampling catheter at a flow rate of 30-500 ml/min.^{2,3} The erroneous attachment of the gas sampling catheter to the reference port causes aspiration of the atmospheric air, there by resulting in the detection of oxygen and the formation of end tidal oxygen trace like the one present during mechanical ventilation. The only difference being that the EtO₂ value will be constant at 21% as present in the atmosphere. As there is negligible CO₂ in the atmospheric air and no anesthetic gases these waveforms will be absent resulting in triggering the apnea alarm by the monitor. The erroneous attachment of the sampling tube is often missed as the ports are situated adjacent to each other. [Figure 2]

Many a times, the anesthesiologist will identify this, and attribute it to faulty equipment and will immediately replace/send the monitor for rectification. A systematic interpretation of the waveform and displayed values is necessary along with careful inspection of the equipment before concluding that the monitor is faulty.

Acknowledgement: NIL

References

1. Vinay B, Sriganesh K, Gopala Krishna KN. An abrupt reduction in end-tidal carbon dioxide during neurosurgery is not always due to venous air embolism: a capnograph artefact. *J Clin Monit Comput.* 2014;28:217-19.
2. Chitilian HV, Kaczka DW, Melo MFV, Miller RD, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Cohen NH, Young WL, et al. Respiratory monitoring. *Miller's Anesthesia*, 8th ed. Philadelphia, PA: Saunders; 2015:1541-1579.
3. Epstein RA, Reznik AM, Epstein MAF. Determinants of distortions in CO₂ catheter sampling systems: a mathematical model. *Resp Physiol.* 1980;41:127-136.