

A subtle break, a cause for variable end-tidal gas analysis

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EDITOR:

Capnography is an essential part of routine monitoring during anaesthesia [1]. During a recent day surgery list, concern arose over our end-tidal gas analysis as within a short period of time significantly varying values for end-tidal carbon dioxide (ETCO₂) were being displayed.

Case report

The patient was having a minor procedure undertaken under general anaesthetic and was self-ventilating via a laryngeal mask. Constant gas flows and volatile agent concentration were used and the patient's minute ventilation remained constant. However, ETCO₂ values, as measured by Hewlett Packard M1026A gas analyser (Hewlett Packard, Berkshire, UK), varied between 22 and 43 mmHg. Initially no cause for these discrepancies could be found but when the patient was manually ventilated with high flows an audible leak was heard. The location of this leak was initially difficult to find but on close inspection of the capnography tubing at the patient end a complete break was noted (Fig. 1).

Discussion

This would normally be obvious and easily identified, however, due to the unique design of this particular capnography tubing, the leak was difficult to locate. The capnography tubing in this case was a reusable Philips Medical Systems (Reigate, Surrey, UK) nafion gas sampling tube. This consists of a central nafion-sampling tubing held within an outer plastic braided coat (13901a; Philips Medical Systems). The effect of this outer braided layer was to give the impression that the gas analysing tubing remained intact even though the central sample tubing had snapped. The significant gap between the two broken ends of the tubing thus caused a leak within the breathing system. This tubing had been replaced on the morning of this incident.

Nafion tubing is used to dry the sample gas and is a tetrafluoroethylene structure with sulphonic

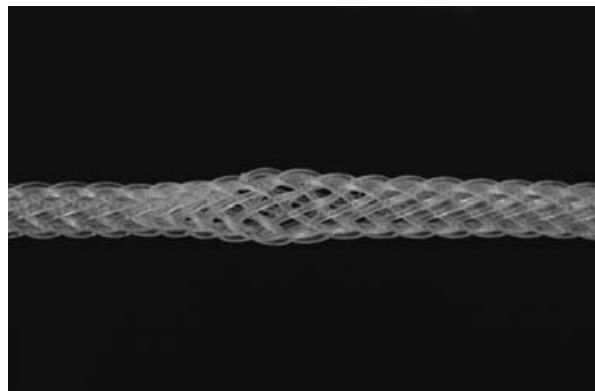


Figure 1.
Core of nafion tubing that has become separated.

acid molecules located throughout. The drying process is achieved by water passing from one sulphonic group to another until it evaporates from the outer wall. This process is driven by the presence of a water pressure gradient between the inside and outside of the tube and the high affinity that sulphonic groups have for water. This tubing can be used with gas analysers that do not have water traps.

Although disconnection of capnography tubing is a common and normally an obvious cause for an airway circuit leak, the design of this type of tubing makes this cause more difficult to detect. Due to this difficulty and the compromise of the essential monitoring of ETCO₂ during anaesthesia, I feel it is important for colleagues to be aware of this possible complication of using nafion tubing.

S. Webster
Sir Humphry Davy Department of Anaesthesia
Bristol Royal Infirmary
Bristol, UK

Correspondence to: Simon Webster, Sir Humphry Davy Department of Anaesthesia, Bristol Royal Infirmary, Bristol, UK. E-mail: simonwebster74@hotmail.com; Tel: +117 928 2163; Fax: +117 928 2098

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1. *Recommendations for Standards of Monitoring During Anaesthesia and Recovery*. London: Association of Anaesthetists of Great Britain and Ireland, 2007.