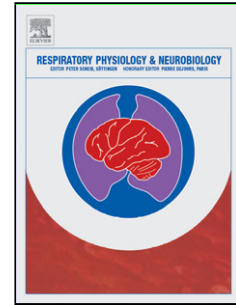


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Capnographic Identification of End-Expiratory Flow Limitation

Abbreviated title: Capnogram phase 5

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Highlights

- Expired CO₂ rises near the end of an exhalation to residual volume.
- The CO₂ rise tracks expiratory flow limitation (EFL), analogous to phase V for N₂.
- Anesthetized patients can have EFL at normal tidal volumes.
- Phase V could be a capnographic marker for EFL during anesthesia.

Abstract

Patients with end-expiratory flow limitation (eEFL) demonstrate a terminal rise in capnography slope. The high slope could represent phase 5, a phenomenon described for single breath N₂ tests but previously unreported during capnography. This study evaluated 6 healthy subjects exhaling from total lung capacity to residual volume at several set constant rates. We measured the volumes of flow limitation (V_{FL}) and phase 5 (V_{P5}) for CO₂ and N₂. A distinct phase 5 occurred shortly after eEFL for both gases. Increased expiratory flow rate resulted in parallel increases in V_{FL} and V_{P5} . The two quantities differed on average by the volume of dead space. These data suggest that phase 5 on capnography identifies eEFL with a small delay resulting from transit of expired gas through dead space. Following phase 5 by volumetric capnography could be useful for monitoring anesthetized patients, who in some circumstances may have lung volumes close to residual volume. eEFL could be treated with lung volume-increasing maneuvers, such as positive end-expiratory pressure.

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