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Title: Volumetric capnography for assessing ventilation inhomogeneity in infants with BPD

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Body: Background: Bronchopulmonary dysplasia (BPD) is characterized by structural lung changes which may affect ventilation distribution. Volumetric capnography (VC) has been used in adults to provide information on ventilation homogeneity and ventilation-over-perfusion status. The aim of this study was to assess the value of VC in assessing ventilation homogeneity in infants with BPD. Methods: Lung function (tidal breathing - multiple breath washout) parameters from 132 healthy infants (94 term, 38 preterm) and 66 infants with moderate or severe BPD were compared. Expiratory capnograms were obtained by mainstream capnography over 100 tidal breaths. The slopes of phases II (SII) and III (SIII) were calculated by linear regression on empirically chosen intervals as follows: For SII between 5 and 60% of the end-expiratory CO₂ fraction and for SIII between 40, 50, or 60 and 95% of the expiratory volume. The correlation between these indices and lung clearance index (LCI) was also assessed. Results: Both SIII and SII were steeper in BPD infants. The SIII40-95% was associated with the higher between-groups difference (Healthy 65 [49-80], BPD 108 [69-171]; P<0.001) with an AUC (ROC curve analysis) of 0.780. The discriminatory ability of the SII/SIII40-95% ratio (capnographic index) was moderate (AUC 0.690), whereas the AUC of LCI was low (0.560) A positive correlation between SIII and LCI was noted, which tended to be stronger and higher in BPD. (Healthy: R² 0.078, beta 0.291 [0.124-0.460], P<0.001; BPD: R² 0.220, beta 0.481 [0.262-0.700], P<0.001). Conclusions: VC might be used as a simpler and faster alternative to the inert gas washout techniques for assessing ventilation inhomogeneity in infants with BPD.