

The use of oxygen reserve index in one-lung ventilation and its impact on peripheral oxygen saturation, perfusion index and, pleth variability index

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Background

Our goal is to investigate the use of the oxygen reserve index (ORi) to detect hypoxemia and its relation with parameters such as; peripheral oxygen saturation, perfusion index (PI), and pleth variability index (PVI) during one-lung ventilation (OLV).

Methods

Fifty patients undergoing general anesthesia and OLV for elective thoracic surgeries were enrolled in an observational cohort study in a tertiary care teaching hospital. All patients required OLV after a left-sided double-lumen tube insertion during intubation. The definition of hypoxemia during OLV is a peripheral oxygen saturation (SpO₂) value of less than 95%, while the inspired oxygen fraction (FiO₂) is higher than 50% on a pulse oximetry device. ORi, pulse oximetry, PI, and PVI values were measured continuously. Sensitivity, specificity, positive and negative predictive values, likelihood ratios, and accuracy were calculated for ORi values equal to zero in different time points during surgery to predict hypoxemia. At Clinicaltrials.gov registry, the Registration ID is [NCT05050552](https://clinicaltrials.gov/ct2/show/study/NCT05050552).

Results

Hypoxemia was observed in 19 patients (38%). The accuracy for predicting hypoxemia during anesthesia induction at ORi value equals zero at 5 min after intubation in the supine position (DS5) showed a sensitivity of 92.3% (95% CI 84.9–99.6), specificity of 81.1% (95% CI 70.2–91.9), and an accuracy of 84.0% (95% CI 73.8–94.2). For predicting hypoxemia, ORi equals zero show good sensitivity, specificity, and statistical accuracy values for time points of DS5 until OLV30 where the sensitivity of 43.8%, specificity of 64%, and an accuracy of 56.1% were recorded. ORi and SpO₂ correlation was found at DS5, 5 min after lateral position with two-lung ventilation (DL5) and at 10 min after OLV (OLV10) ($p = 0.044$, $p = 0.039$, $p = 0.011$, respectively). Time-dependent correlations also showed that; at a time point of DS5, ORi has a significant negative correlation with PI whereas, no correlations with PVI were noted.

Conclusions

During the use of OLV for thoracic surgeries, from 5 min after intubation (DS5) up to 30 min after the start of OLV, ORi provides valuable information in predicting hypoxemia defined as SpO₂ less than 95% on pulse oximeter at FiO₂ higher than 50%.