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Evaluating Preoxygenation Using Oxygen Reserve Index (ORI™) in Healthy Adult Volunteers

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Background

Preoxygenation is essential for prevention of hypoxia during induction of anesthesia. Methods to quickly oxygenate blood have been explored. Oxygen Reserve Index (ORi), expressed as a number between 0.00 and 1.00, is a novel noninvasive indicator of blood oxygenation. The aim of this study is to compare different preoxygenation methods using ORi.

Method

Ten healthy volunteers were preoxygenated using four methods (TVB1.0, DB1.0, TVB0.6, DB0.6) consisting of combinations of breathing depth [tidal volume breathing(TVB) or deep breathing (DB)] and inspired fractional O2 [FiO2 1.0 or 0.6]. Preoxygenation was continued until ORi reached a plateau. Subjects then breathed room air until ORi dropped to 0.00. Preoxygenation efficiency was assessed using the time for ORi to reach a plateau (Tup), and efficacy was assessed by the time from plateau to baseline (0.00) following discontinuation of oxygen administration (Tdn).

Results

Median Tup using TVB 1.0, DB 1.0, TVB 0.6, DB 0.6 were 91.0, 47.0, 102.0, 54.0 seconds respectively. Tup was significantly shorter with DB than TVB [TVB1.0-DB1.0=44sec (p=.004), TVB0.6-DB0.6=48sec (p=.015)]. There was no significant difference in Tdn or ORi plateau value.

Discussion

Preoxyenation with DB was more efficient, as indicated by a short Tup. Deep breathing appears useful to achieve quicker preoxygenation. Preoxygenation effectiveness as measured by Tdn did not change with breathing method or FIO2. Preoxygenation at FIO2 0.6 may be as effective as FIO2 1.0. However, oxygen reserve consists of both blood and lung oxygen content, and is difficult to evaluate using only a single blood or respiratory parameter.

Conclusion

1) Preoxygenation (as measured by increase in ORi) was faster with DB than TVB. 2) FIO2 (0.6 or 1.0) had no significant effect on Tup or Tdn. ORi plateau may be used as a clinical indicator of adequate preoxygenation.