

[GA1-53] Non-invasive carbon dioxide monitoring during robotic, laparoscopic-assisted bariatric surgery in severely obese adolescents: transcutaneous vs. end-tidal techniques.

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Background: The partial pressure of carbon dioxide (PaCO₂) derived from an arterial blood gas is the gold standard to determine the adequacy of ventilation. End-tidal CO₂ (ETCO₂) is a continuous measurement that generally approximates the PaCO₂ although accuracy can be affected by abnormal pulmonary function or during laparoscopy. Transcutaneous CO₂ (TCCO₂) monitoring has been shown to be accurate in children and adults in the normal carbon dioxide range. The accuracy of these monitors may be less in obese patients and at extremes of PaCO₂. We hypothesized that the TCCO₂ device would provide a more accurate measure of PaCO₂ compared with the ETCO₂ in severely obese adolescents during laparoscopic surgery.

Methods: We evaluated the gradient between the PaCO₂ and TC-CO₂ as well as the PaCO₂ and ET-CO₂ during robotic, laparoscopic-assisted bariatric surgery (vertical sleeve gastrectomy) in adolescents. Anesthetic monitoring (ASA specific monitors plus an arterial cannula), induction, and maintenance were standardized. After induction, the TC-CO₂ monitor (SenTec AG, Therwil, Switzerland) was calibrated and applied to the patient's thorax below the clavicle as per the manufacturer's guidelines. When an arterial blood gas was obtained, simultaneous values from the TC and ET-CO₂ monitors were recorded. Statistical analysis included a Bland-Altman analysis and a Fisher's exact test.

Results: The study cohort consisted of 15 severely obese adolescents undergoing vertical sleeve gastrectomy. The bias and precision were -2.5 ± 5.6 when comparing the TC-CO₂ to the PaCO₂ and -1.9 ± 3.5 for the ET-CO₂ versus PaCO₂. The difference between the TC-CO₂ and PaCO₂ was ≤ 3 mmHg in 21 of 33 samples while the difference between the ET-CO₂ and PaCO₂ was ≤ 3 mmHg in 18 of 33 samples (P=NS for accuracy of TC vs. ET-CO₂).

Conclusions: Both ET-CO₂ and TC-CO₂ show a reasonable accuracy as a surrogate for PaCO₂ during laparoscopic bariatric surgery. In obese children, unlike the adult population, even during laparoscopy and insufflation, ETCO₂ can be used to estimate the PaCO₂.

References:

- Bernet-Buettiker V et. al. Pediatrics 2005;115:e64-e68.
 - Griffin J et. al. Br J Anaesth 2003;91:498-501.
 - Maniscalco M et. al. Intensive Care Med 2008;34:1340-1344.
 - Parker SM et. al. Respir Med 2007;101:261-264.
 - Bendjelid K et. al. Crit Care Med 2005;33:2203-2206.
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