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: