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## **A New Approach to Evaluate Early Postoperative Respiratory Compromise in Morbidly Obese Patients**

Deborah M. Williams, BA, John L. Chow, MD, MS, Hendrikus J. Lemmens, MD, PhD, Shawn Hodge, MD, and John G. Brock-Utne, MD, PhD.

*Department of Anesthesia, Stanford University School of Medicine*

**Introduction:** Morbidly obese patients, especially those with obstructive sleep apnea (OSA), are at risk for respiratory events after general anesthesia, which can contribute to morbidity and mortality. Although prompt detection of airway obstruction and apnea in the early postoperative period may improve patients' outcome in this growing surgical population, the incidence of respiratory events immediately following surgery in the post-anesthesia care unit (PACU) has not been evaluated. We studied the incidence of airway obstruction and apnea in morbidly obese patients recovering from general anesthesia after laparoscopic gastric bypass surgery by employing combined end-tidal carbon dioxide (ETCO<sub>2</sub>) and impedance respiratory plethysmography monitoring in the Post-Anesthesia Care Unit (PACU).

**Methods:** Patients (N=51; Male:Female=7:44; body mass index (BMI)  $45 \pm 6$  kg/m<sup>2</sup> [means $\pm$ SD]) were enrolled after Institutional Review Board approval and informed consent obtained. Fourteen patients (28%) had OSA and ten required nocturnal Continuous Positive Airway Pressure (CPAP) or Bilevel Positive Airway Pressure (BiPAP) at home. Intraoperatively, all patients received both inhalational and intravenous anesthesia. Monitoring of respiration in the PACU was achieved by Microstream<sup>®</sup> capnometer and Phillips M1002B impedance respiratory plethysmography monitor.

**Results:** Of the 51 patients monitored in the PACU (duration  $1.19 \pm 0.34$  h), 2 (3.9%) had apnea, 7 (13.7%) had airway obstruction, 10 (19.6%) had false apnea alarm, and 45 (88.2%) did not have any evidence of respiratory compromise. Of the 850 measurements obtained, there were 2 episodes of apnea (0.2%), 10 episodes of airway obstruction (1.2%), and 24 episodes of false apnea alarm (2.8%). The incidence of airway obstruction was higher than apnea ( $P < 0.03$ ). Arterial oxygen saturation (SpO<sub>2</sub>) of the patients during apnea was not different from their baseline ( $98.5\% \pm 2.1\%$  vs.  $97.3\% \pm 2.8\%$ ,  $P > 0.05$ ). SpO<sub>2</sub> of the patients during airway obstruction was not different from their baseline ( $96.7 \pm 2.4\%$  vs.  $96.8\% \pm 1.3\%$ ,  $P > 0.05$ ). Higher BMI did not increase the incidence of airway obstruction or apnea ( $P > 0.05$ ). However, patients with OSA had higher incidence of airway obstruction ( $P < 0.02$ ) but not apnea ( $P > 0.05$ ). None of the patients on home CPAP or BiPAP required its use in the PACU. Early intervention with verbal stimulation, chin-lift, or jaw-thrust was sufficient to terminate all episodes of apnea and airway obstruction upon detection.

**Conclusions:** Combined monitoring of ETCO<sub>2</sub> and impedance respiratory plethysmography represents a new approach to provide timely and precise identification of the etiology of respiratory compromise during the early postoperative period. Our data suggest that prompt detection and appropriate interventions could minimize any significant arterial hypoxemic

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events. This is especially critical in morbidly obese patients, when arterial hypoxemia manifests as oxygen desaturation and often is a late sign of respiratory compromise.