Endoscopic Sedation in the Bariatric Patient: Skating on Thin Ice?

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The best preparation for tomorrow is to do today's work superbly well.
—Sir William Osler

Obesity remains a significant health problem in the USA. Slightly over a third of adults over the age of 20 are obese (BMI > 30 kg/m²) [1] and 5.7 % are classified as extremely obese with a BMI > 40 kg/m² [2]. In this issue of *Digestive Diseases and Sciences*, Jirapinyo et al. [3] provide more insight into an area of gastrointestinal endoscopy that remains sparsely populated with safety and efficacy data, namely endoscopist-directed sedation in obese subjects. The authors provide data on 1,385 consecutive upper endoscopic procedures for which moderate sedation was given, reporting an overall incidence of unplanned events of 1.6 %, with 0.6 % cardiopulmonary adverse events (CAEs) and 0.7 % requiring early termination of the procedure.

Interpretation of studies of this nature is dependent on the authors' definition of a cardiopulmonary adverse event. In the discussed study, the definitions included systolic hypotension with a value less than 90 mm Hg, cardiac arrhythmia (heart rate >120 or <60 beats per minute requiring treatment or premature termination of the procedure), or significant hypoxemia requiring temporary removal of the endoscope. Although the definition of hypotension is standard and widely accepted, the heart rate definition allows a degree of "subjectivity creep." The defined endpoints for treatment and premature termination of the procedure may not have been uniform. For example, with the "significant

hypoxemia" outcome, there were no established thresholds for the depth and duration of the event. Since the authors were not able to capture transient hypoxic episodes not requiring endoscope withdrawal, the true prevalence of CAEs was likely underreported. Clearly, the use of a unified CAE taxonomy would help bring order and uniformity to the reporting of safety outcomes for procedural sedation [4].

The Clinical Outcomes Research Initiative (CORI) database has provided a glimpse into immediate adverse events requiring an unplanned intervention. In an analysis including 1,590,648 procedures of which 543,950 were upper endoscopies, increasing American Society of Anesthesiologists (ASA) physical classification was associated with a higher prevalence of unplanned events [5]. The overall prevalence for unplanned events during upper endoscopy was 0.33 % utilizing the CORI database, compared with 1.6 % in the discussed study, which is 4.8 times higher. Of course, the types and definitions of the outcomes were different in both studies, but the difference in prevalence should give one pause. In an earlier study utilizing CORI, Sharma et al. [6] reported a host of independent risk factors for cardiopulmonary unplanned events. In addition to increasing with ASA classification ascendancy, other risk factors included inpatient procedures, non-university endoscopy sites, use of supplemental oxygen, and trainee involvement. Unfortunately, neither CORI study was able to address BMI as a potential risk factor.

Obesity is a risk factor for sedation-related complications for anesthesia-assisted advanced endoscopic procedures such as endoscopic ultrasonography and endoscopic retrograde cholangiopancreatography. Wani et al. [7], in a study of 1,016 patients undergoing advanced endoscopic procedures, reported that age, BMI dichotomized as <30 versus ≥30, and an ASA physical classification ≥3 were independent risk factors for sedation-related complications.

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In a study involving 80 outpatients undergoing a variety of procedures with endoscopist-directed sedation with an opioid and a benzodiazepine, independent risk factors for hypoxemia were age ≥ 60 years and the total meperidine dose [8]. BMI significantly correlated with the number of hypoxemic episodes.

In the discussed study, the BMI data need to be dissected further. The BMI for the entire group undergoing upper endoscopy was 35.1 ± 7.7 , yet in the group developing adverse events, it was 52.1 ± 11.4 , a trend that merits closer scrutiny in future studies.

Obstructive sleep apnea (OSA), inextricably linked to obesity, may amplify the risk of CAEs. Khiani et al. prospectively studied 261 subjects undergoing ambulatory upper endoscopy and colonoscopy with endoscopist-directed sedation with a benzodiazepine and opioid targeting moderate sedation [9]. The Berlin questionnaire, a validated tool for identifying patients at risk of OSA, was used. Ninety patients (39 %) were identified as being at high risk of OSA. In this study, hypoxemia was the primary outcome, defined as plasma O_2 saturation <92 % as measured with pulse oximetry and requiring an increase in the FIO_2 of supplemental oxygen. There was no significant difference in the hypoxemia rate between subjects who were identified as high and low risk of OSA (odds ratio 1.48, 95 % CI 0.58–3.80). For patients requiring monitored anesthesia care, the landscape for OSA and the risk of CAEs shift. The STOP-BANG (an acronym for Snore, Tired, Obstructive breathing, high blood Pressure, BMI, Age, Neck circumference, and male Gender) screening tool utilizes four questions and four clinical characteristics to stratify patients into high- and low-risk groups for OSA [10]. Cote et al. [11] utilized the STOP-BANG (SB) tool in a cohort of 231 patients undergoing advanced procedures such as ERCP and EUS and receiving propofol-based, anesthesiologist-directed deep sedation or general anesthesia. The authors reported that in patients with a positive SB score, the incidence of hypoxemia as higher as was the need for anesthesiologists to perform airway maneuvers such as a chin lift or placement of a nasopharyngeal airway. Using similar methodology, Mehta and colleagues reported in a cohort of 243 patients undergoing upper endoscopy or colonoscopy that a higher STOP-BANG score was not associated with an increased incidence of sedation-related adverse events or with airway interventions [12]. However, a higher BMI was associated with an increased incidence of both outcomes. The relative brevity of the procedures in the Mehta study when compared to Côté et al. may lead to the disparate results. One would reasonably expect that an upper endoscopy or colonoscopy may in the majority of instances take more time than an ERCP or EUS. Perhaps, the effect site concentration of propofol is higher in these longer cases, which could trigger adverse physiologic outcomes. In the discussed study, the only predictor of the total dose of fentanyl and midazolam was procedure time. Only three

instances of hypoxemia leading to early termination of the procedures were noted. A more conservative problem definition of hypoxia most likely would have increased its incidence.

Therefore, given the data, from Jirapinyo and colleagues, let us continue to tread lightly. For the majority of cases, gastroenterologist-directed sedation targeting moderate sedation is safe and effective, given the availability of an appropriately trained endoscopy team. More data are necessary to provide a robust and accurate snapshot of the risk of CAEs in other settings in order to provide the appropriate level of sedation using the correct sedation regimen which is delivered by suitable personnel.

Conflict of interest John Vargo is a consultant in Boston Scientific, Inc., Cook Medical, Inc., Ethicon EndoSurgery, Inc., and Olympus America, Inc.

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