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Cortical electrical activity monitoring during anesthesia of the morbidly obese patient

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Abstract: **Introduction:** Today obesity is an epidemic, especially affecting the Western hemisphere. Incomplete data speak about some 1.7 billion people world-wide who are overweight or obese. The Food Research and Action Center reported in 2012 that in the United States 69% of adults were overweight and 36% were obese. The anesthesiologist encounters the obese in the operating theater in three situations (1): when the obese patient is scheduled to have a surgical procedure unrelated to his/her overweight condition; in cases where obesity is the etiologic factor of the surgical disease (such as cholecystitis or osteoarthritis); and finally when the patient is a candidate for bariatric surgery. Anesthesia for obese patients raises a series of problems for the practitioner, such as anatomic problems that create difficulties related to performing invasive procedures (tracheal intubation, catheterization of central veins, spinal or epidural punctures), but also those related to the so-called "metabolic syndrome" (hyperglycemia accompanied by insulin resistance, hypertension, dyslipidemia, etc.). One of the less known aspects of anesthesia of the obese patient is the difficulty in establishing the proper dosage of anesthetic drugs. This can lead to a too superficial stage of general anesthesia with some untoward side effects, such as accidental awareness or instability of the cardiovascular system during surgery. **Why is so difficult to establish the proper dosage of an anesthetic drug in obesity?** The classical recommendations of dosing anesthetic drugs in case of obesity are rather confusing because some of them refer to the ideal body weight and others take into consideration lean body or total body weight. It is a well-known fact that the adipose tissue acts as a reservoir for many anesthetic drugs, it empties slowly and thus delays recovery. In addition, the hepatic function, which is responsible for the metabolism of a good part of the anesthetic drugs, is affected by the hepatic steatosis present in some 75% of obese patients (2). On the other side, renal clearance in the obese patient is enhanced (and as a result the drug elimination is more rapid), due to increase in the renal blood flow (3). Some studies proved that the average anesthesiologist does not know how to calculate the anesthetic dosage in the case of an obese patient, a situation that produces periods of unwanted superficial anesthesia or, to the contrary, a delay in recovery after surgery. **The proposed solution**: Since the classical signs (blood pressure, pulse, etc.) do not always reflect the real depth of general anesthesia, a solution would be the use of computerized cortical electrical activity for monitoring and adjusting the dosage in accordance with one of the well-known EEG variables. One EEG parameter, the bispectral index (BIS), was used in the past by Paventi et al. (4) as a monitor of general anesthesia for morbidly obese patients. They found that the patients monitored with BIS had a shorter awakening time and also a shorter extubation time. A pilot study performed by us in six German medical centers on anesthetized patients (5) and a clinical trial in sedated critical care patients (6) showed that one of the computerized EEG parameters, spectral edge frequency (SEF), could be easily used to guide the management of general anesthesia or sedation. As a result, in the recent past we used SEF for monitoring anesthesia of 71 morbidly obese patients (BMI>35) scheduled to have laparoscopic gastric banding. The EEG monitor screen was hidden from the anesthesiologist in charge of the patient, so he/she was completely free to use the desired anesthetic regimen and dosage. The results (7) showed a large variability of anesthetic dosage and also of the SEF parameter. When we divided our patients in two groups: the first in which SEF remained in the "normal" range (8–12 Hz) **more** than 80% of the time, and a second in which SEF stayed in the 8–12 Hz range **less** than 80% of the anesthesia maintenance time, the statistical analysis of the need for postoperative analgesia showed significant differences. Those patients with the SEF remained more than 80% of the time in the desired range, needed less morphine in the immediate postoperative period, and the need for the first dose of morphine was significantly delayed in comparison to the second group. An editorial by Yli-Hankala (8) mentioned that these results imply that we usually under-anesthetize our morbidly obese patients and that too light anesthesia might expose these patients to severe postoperative pain. **Conclusions:** More and more obese patients become candidates for surgery. General anesthesia of the morbidly obese patient is not simple. Besides the well-known anatomic and metabolic problems, one could add that of titrating anesthetic drug dosage. The literature lacks precise guidelines in this direction, so the danger of underdose (accidental awareness) or overdose (hemodynamic instability) is to be taken into consideration. If so, it seems recommendable to use a computerized EEG parameter in order to guide the anesthetic drugs administration in case of morbid obesity. Besides prevention of undesired variations of depth of anesthesia, the proposed monitoring could also offer a better postoperative analgesia and a decrease in the need of analgesic drugs after surgery.

Biography: Gabriel M. Gurman, MD graduated the University of Medicine of Bucharest in the year of 1962, at the age of 22, and became a specialist in Anesthesiology and Critical Care in 1966 in Romania and 1974 in Israel. He is currently a professor of Anesthesiology and Critical Care at Ben Gurion University of the Negev and director of the Division of Anesthesia and Critical Care at Maney Hayeshuah Medical Center in Israel. He is also the Chairman of the European Society of Computing and Technology in Anesthesia and Intensive Care (ESCTAIC) and was recently elected chief Editor of the European Society of Anesthesiologists (ESA) Newsletter. He published more than 100 papers in peer review journals and served as a member of a number of scientific journals in Israel and abroad.