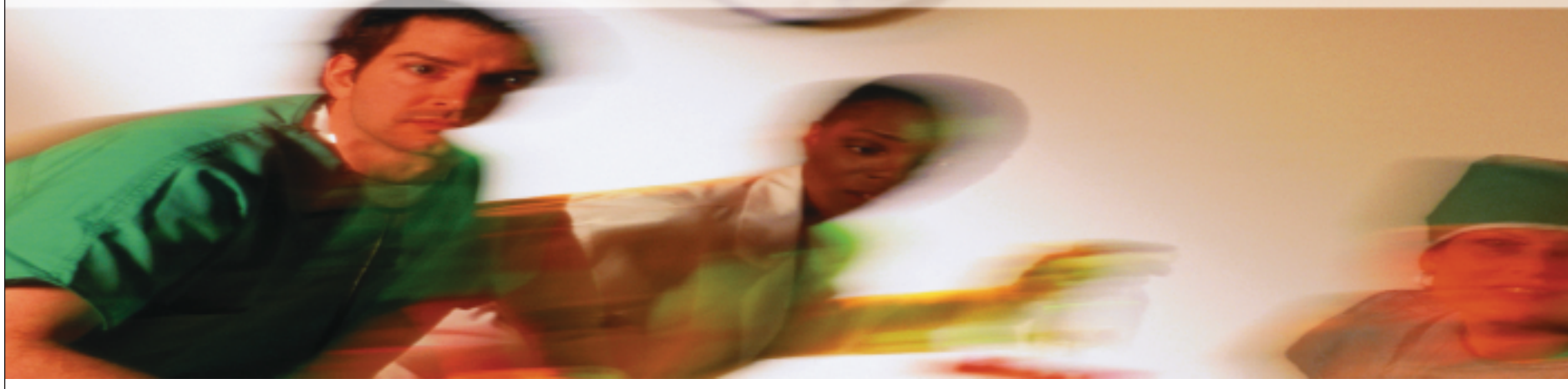

LIGHT SLEEPER

Minimally invasive anesthesia technique simulates conditions of general anesthesia with enhanced safety

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Corona del Mar, Calif. ◆ Using propofol (Diprivan; AstraZeneca), ketamine (Ketalar; Parke Davis), local anesthetic, and a bispectral index (BIS) monitor (Aspect Medical Systems, Inc., Norwood, Mass.), the minimally invasive anesthesia (MIA) technique represents a safer, simplified and less-costly approach to anesthesia that is appropriate for all cosmetic surgery procedures, says Barry L. Friedberg, M.D., innovator of the technique.

Dr. Friedberg

Dr. Friedberg is a board-certified anesthesiologist based in Corona del Mar, Calif., where he specializes in the practice of office-based anesthesia for elective cosmetic surgery. He introduced propofol ketamine monitored anesthesia care (PK MAC) 15 years ago. Ten years ago, the BIS monitor was added to PK MAC, making it the MIA technique.

In addition to using a minimal number of medications, the simplicity of the technique facilitates room air spontaneous ventilation (RASV) and reduces equipment and instrumentation needs. The MIA technique involves only three medications and is performed with routine vital signs monitoring and a BIS monitor to measure level of consciousness. In comparison, general anesthesia typically involves administration of 12 to 15 agents, necessitates an anesthesia machine and routine supplemental oxygen, and has airway management issues as well as scavenging considerations for exhaled gases and vapors. General anesthesia also includes an increased risk of thromboembolic phenomenon secondary to pooling of blood in the pelvic veins.

NO TRESPASSING Based on its differences with general anesthesia, the MIA technique has important benefits. For the surgeon, it is able to simulate the operating conditions of general inhalational anesthesia but with much greater safety because it creates a minimal physiologic trespass. In addition, the MIA technique involves no medications that are triggers for malignant hyperthermia (MH) or post-operative nausea and vomiting (PONV). In addition, RASV avoids the potential fire hazard during laser procedures that accompanies the routine use of oxygen. The MIA technique also provides preemptive analgesia that essentially eliminates the need for post-operative opioids, a well-known etiologic factor for PONV.

"Change is the most difficult thing to accomplish in the world, and the approach to cosmetic surgery anesthesia I am advocating represents a profound change in the conventional conceptualization of that task. However, I believe there is no acceptable threshold for risk of anesthesia-related complications in elective cosmetic surgery. With its superior safety profile, the MIA technique offers the best method for achieving that goal," Dr. Friedberg tells ***Cosmetic Surgery Times***.

"The MIA technique has multiple benefits for the surgeon and anesthesia provider performing the procedure, the family members or friends who are the post-op caregivers, and especially for the patients who do not feel, hear or remember their operation and are universally happy secondary to the euphorigenic effects of propofol."

Dr. Friedberg says the MIA technique is appropriate for all cosmetic procedures because by definition all cosmetic surgery, including rhinoplasty and abdominoplasty, is minimally invasive.

NO DEEP NEED "There is no cosmetic surgery that is intra-abdominal, intra-cranial, or intra-thoracic. Since there is less involvement of the patient's critical organs and systems, these procedures require less deep anesthesia. Certainly general anesthesia can be used safely for cosmetic surgery," Dr. Friedberg says, "but that does not mean it should be used. When it comes to anesthesia safety, less trespass is better. The MIA technique represents an alternative approach to avoid putting patients at undue risk."

The MIA technique is performed using the BIS monitor, which measures the brain electroencephalogram and processes that information to provide a numerical indicator of the hypnotic component of the anesthetic state. The BIS numeric scale ranges from 0 to 100, where 100 indicates the patient is fully awake and 0 represents absent brain activity. In the MIA technique, propofol is titrated to maintain a BIS level between

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60 and 75. General anesthesia, in comparison, is associated with a BIS level between 45 and 60 when patients are given systemic analgesia.

PROPOFOL PROTOCOL The MIA is performed with incremental induction. Propofol is administered using a mini-drip or an infusion pump while the anesthesia provider talks to the patient until loss of lid reflex and verbal contact occurs and vital signs are monitored. The BIS monitor provides an instantaneous, electromyographic (EMG) tracing of frontalis muscle activity. As the propofol takes effect, the patient first falls asleep, and then the EMG activity starts to decrease. Reflecting the processing time required for the BIS algorithm, there is a short delay of 15 seconds to 30 seconds until the BIS starts to decrease. Once adequate hypnosis occurs, measured by a BIS level of below 75, a 50-mg dose of ketamine is administered.

"Traditionally, anesthesia doses have been based on a milligram per kilogram basis," Dr. Friedberg explains. "That was acceptable in the era before it was possible to measure the target organ, the brain. Using the BIS monitor allows propofol dose titration based on the individual patient's response. There is a nineteen-fold variation in the rate at which patients metabolize propofol. Measuring propofol effect is clearly safer than guessing."

"The use of a constant ketamine dose is also baffling to some, but the fact is that the dissociative phenomenon achieved with ketamine is typically all or nothing. The NMDA receptors in the brain and spinal cord — the target for ketamine — are present in similar numbers regardless of patient weight and gender. It is possible to achieve a fairly good dissociative response using a 25-mg dose of ketamine, but as long as the patient has received a hypnotic dose of propofol, measured by a BIS level below 75, there is no increased risk of ketamine-induced hallucinations from using the higher ketamine dose," he says.

The patient is able to tolerate injection of the local anesthetic two minutes to three minutes after ketamine administration. Dr. Friedberg encourages injecting the entire operative field with the initial dissociative dose of ketamine. Up to 50 mg per kilogram of lidocaine as dilute, tumescent or wetting solution (i.e. 500 mg in 1,000 ccs) may be used for cases requiring large areas of analgesia. Re-injection of previously injected fields does not usually require additional ketamine. When trended as a secondary trace, a spike in the EMG may be used to predict inadequate analgesia and impending patient movement. The anesthesiologist may use the time delay in the change of the BIS value to administer a bolus of propofol while the surgeon also supplements the local anesthesia, Dr. Friedberg explains.

MONITOR AS CASE MANAGEMENT TOOL "Maintenance of the BIS target range of 60 to 75 for the MIA technique assures the patient is asleep. Therefore, any movement that occurs is more likely to be generated from the spinal cord, has nothing to do with consciousness, and reflects a need for more local anesthesia. It is infinitely safer to inject a little more lidocaine than to try to control movement by administering more propofol or ketamine or adding an opiate. In this regard, the BIS monitor is not just a way for the anesthesiologist to monitor the response of the target organ to propofol, but it is a case management tool that allows the surgeon and anesthesiologist to interact in the most effective manner to achieve the best patient outcomes," Dr. Friedberg notes.

Although spontaneous ventilation is maintained, a nasopharyngeal airway is sometimes used to maintain airway patency during procedures such as blepharoplasty in which the head is in a neutral position. A laryngeal mask airway is used to prevent blood from draining into the larynx and stomach during rhinoplasty with osteotomies.

As per the Harvard guidelines accepted by the American Society of Anesthesiologists, traditional vital signs are monitored during the MIA technique, including electrocardiography, noninvasive automated blood pressure and pulse oximetry. However, since opioids are not used, end-tidal carbon dioxide monitoring is not mandatory.

RAPID CLEARANCE, CLEAR-HEADEDNESS Because propofol is rapidly metabolized, patients recover within minutes after administration is stopped, and they are more clearheaded than after anesthesia that includes benzodiazepine administration. Patients in recovery are quickly able to swallow and are given a 1000-mg dose of acetaminophen for supplemental post-operative analgesia when needed. Only occasionally do patients require intravenous ketorolac as a rescue analgesic. Dr. Friedberg believes that the need for minimal pain medications after the MIA technique reflects its ability to reliably provide preemptive analgesia.

"There appears to be something profoundly different about the train of sensory stimulation when patients are under general anesthesia versus the MIA technique," he observes. "General anesthesia primarily blocks the brain from responding to noxious stimuli, whereas the MIA technique may be considered a 'midbrain spinal anesthetic,' blocking the noxious signals from going above the midbrain into the cortex. Pain itself can cause PONV, and preemptive analgesia eliminates the majority of this issue."

Neither propofol nor ketamine are emetogenic drugs, and patients are not routinely given any anti-emetic medication. In a review of nearly 2,700 cases performed with the MIA technique, Dr. Friedberg found the incidence of PONV was only 0.6 percent.

"PONV is a major concern of patients who are planning to undergo any elective surgery — especially cosmetic. Suture dehiscence and hematoma formation are well-known side effects of PONV above and beyond the misery of the experience. Notably, this unprecedented, low rate of PONV following the MIA technique was achieved in a population that included a significant proportion of patients at high-risk for PONV, i.e., nonsmoking females having elective cosmetic surgery with a previous history of PONV and/or motion sickness. Even the 13 patients who were affected stated a preference for the MIA technique over a previously received anesthetic," he adds.

REPRODUCIBLE OUTCOMES Dr. Friedberg acknowledges that some critics of MIA technique object to the absence of Level 1 evidence documenting its reproducibility. As testimony to reproducibility, Dr. Friedberg notes he has personally provided the MIA technique for more than 3,000 patients of more than 100 different surgeons.

Christian Apfel, M.D., a renowned PONV expert, has written a protocol for a study comparing the MIA technique to anesthesia with propofol and fentanyl. So far, six university hospitals have declined to conduct that trial. In the meantime, Dr. Friedberg believes the utility of the MIA technique may still be assessed based on the extensive favorable clinical experience with the technique.

Interestingly, the technique has recently found mission-critical utility and merit in a venue far removed from the cosmetic surgical procedures for which it was developed. Military surgeons, desperate to find an anesthesia technique for battlefield applications that didn't require desert-problematic and dangerous-to-transport oxygen tanks, discovered Dr. Friedberg's MIA approach on his Web site. Officials invited him to instruct the doctors at Brooke Army Medical Center in San Antonio on his method. In March, Dr. Friedberg was honored with a Congressional proclamation for his "contribution to military anesthesia in Iraq and Afghanistan, sparing the need for anesthesia machines in field hospitals."

Disclosures
Dr. Friedberg has no financial interest in Aspect Medical Systems, makers of the BIS monitor, or any of the drugs mentioned in this article.

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More information on the MIA technique may be found in *Anesthesia in Cosmetic Surgery*, Barry L. Friedberg, M.D., Cambridge University Press. Information on this title: www.cambridge.org/978052187090