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In Response:

The letter from Dr. Venkatesan (1) correctly notes that several months before publishing our article (2) in *Anesthesia & Analgesia*, Yildirim et al. (3) had published an article regarding the influence of desflurane on some variables of cardiac ventricular repolarization. Yildirim et al.'s paper was published after our manuscript had been submitted to *Anesthesia & Analgesia*, and we had no knowledge of their work at the time our work was submitted.

However, in our opinion the patients in the Yildirim et al. study may not have received the equivalent of 1 MAC of anesthesia. Patients in that study ranged from 16 to 50 yr of age. Rampil et al. (4) determined 1 MAC of desflurane in 100% oxygen as 7.25 ± 0.0 vol% in the 18-30-yr age range and 6.0 ± 0.29 vol% in the 31-65-yr age group. This suggests that some patients in the Yildirim et al. study received <1 MAC of desflurane.

Dr. Venkatesan suggested two mechanisms connected with use of volatile anesthetics that may prolong the QTc interval and induce arrhythmia: reduction of I_K current for sevoflurane and an increase in transmural dispersion of repolarization for halothane. The first mechanism was also described for isoflurane and halothane (5). There was no increase in transmural dispersion of repolarization for sevoflurane in children (6). We are not familiar with any data on the mechanism of QTc prolongation with desflurane. It seems probable that the prolongation might be caused by the influence of desflurane on I_K current, similar to that induced by sevoflurane and isoflurane. Moreover, transient increases in sympathetic activity from desflurane might further prolong the QTc interval. As suggested by Yildirim et al., potential arrhythmogenic effects of desflurane may be caused by increased dispersion of the QTc interval. Further research is required to fully understand the mechanisms of QTc prolongation with inhaled anesthetics.

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In Response:

We appreciate Dr. Venkatesan's acknowledgment of our work (1). QT interval prolongation is associated with life-threatening arrhythmias. Inhaled anesthetics prolong the QT interval (2) and can induce life-threatening arrhythmias in patients with prolonged QT interval (3).

We studied the effects of three inhaled anesthetics (sevoflurane, isoflurane, and desflurane) on QT interval, QTc interval, QT dispersion, and QTc dispersion (4). At the time we were unaware of any previous studies on the effect of desflurane on QT interval and were unaware of the continuing work by Owczuk et al. (5).

In our view, further clinical studies are needed to fully understand the arrhythmogenic properties of inhaled anesthetics.

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Anesthesia for Craniotomy with Intraoperative Awakening: How to Avoid Respiratory Depression and Hypertension?

To the Editor:

We read with interest the article by Keifer et al. (1). However, we have some concerns about their anesthetic technique for craniotomy with intraoperative awakening. The authors managed the airway with a nasal cannula, facemask, or nasal trumpets. Patients breathed spontaneously. They observed respiratory depression in 69 of 96 patients (defined as an episode of apnea lasting at least 30 s) and hypercarbia ($P_{aCO_2} > 50$ mm Hg) in almost one third of the patients. The authors used mannitol and furosemide in all patients and did not report cases of "tight brain."

We believe that a laryngeal mask airway might have offered advantages by providing a more secure airway and allowing controlled ventilation, as described by Sarang and Dinsmore (2). This technique might avoid the ventilatory depression and hypercarbia observed by Keifer et al., as well as the need to administer mannitol and furosemide. Diuretics may cause dehydration, hypotension, and electrolyte disturbance, and routine administration of diuretics might be avoided if CO_2 were not allowed to increase.

The use of laryngeal mask and controlled ventilation would require larger doses of propofol and remifentanyl, possibly delaying emergence for brain mapping. The use of target-controlled infusion devices (or pharmacokinetic simulations) has been shown to decrease time for awakening during craniotomies and provide hemodynamic stability (3,4). This technique may be a useful alternative for craniotomies requiring intraoperative awakening.

The authors also reported the occurrence of hypertensive episodes during Mayfield holder placement and suggested the use of short-acting vasodilators to avoid those episodes. Such episodes might be avoided by administering a bolus of remifentanyl. Vasodilators may cause cerebral vasodilatation and increase intracranial pressure, whereas remifentanyl would have a limited effect on intracranial pressure. Hypertensive episodes related with intraoperative emergence can be avoided by continuing a small-dose infusion of remifentanyl and propofol (3,4).

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In Response:

The letter by Drs. Lobo and Amorim raises some important points requiring clarification.

The technique presented in our retrospective review (1) is most accurately described as a "wake up" craniotomy (2). This requires general anesthesia for the cranial and dural opening, emergence for intraoperative cortical mapping, and return to general anesthesia for the completion of the surgery. This anesthesiologist must control the airway and ventilation during the general anesthetic portion of the case while also providing a smooth emergence at the time of the cortical testing.

In a perfect world, one would select a technique which allowed for unobstructed spontaneous ventilation while the patient was in a lateral position with the head secured in a Mayfield head holder. At the time of surgical testing, the anesthetic would be discontinued and the patient would gently awaken with no stimulation of the airway. We took a minimalist approach in our series, securing the airway through positive airway pressure supplied by nasal trumpets. Other authors have used techniques ranging from laryngeal mask airway to endotracheal intubation to control the airway during the general anesthetic portion of the case. Whichever method is selected, however, one must consider several consequential decisions:

1. Is the anesthetic depth sufficient to enable the patient to tolerate airway instrumentation during general anesthesia?
2. Is it possible to remove the device from the airway to permit testing of speech capacity?
3. Is the airway adequately protected to prevent reflux for patients at risk?
4. Does the technique provide adequate ventilation, or permit the anesthesiologist to control ventilation if necessary?

Although not used routinely in our retrospective series, the laryngeal mask airway might address these concerns if used judiciously.

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Stimulating Catheters in Continuous Popliteal Block

To the Editor:

Casati et al. (1) contend that stimulating catheters are more useful than nonstimulating catheters in continuous posterior popliteal sciatic nerve block. However, there are several questions that need to be addressed to interpret their results, specifically:

1. Given that the sciatic nerve divides at a mean distance of 60.5 ± 27.0 mm above the popliteal fossa crease (2) in their study, how far was the puncture site above the crease?
2. Could the catheter tip position have affected the onset time for sensory and motor block?
3. What motor response was observed with the needle and the stimulating catheter? Was there any difference in the motor response observed with the needle and with the stimulating catheter?
4. Why was the onset of sensory and motor block shorter for the common peroneal nerve than for the tibial nerve? Specifically, was the catheter tip placed closer to the common peroneal nerve?
5. If "there was no difference in the quality of pain relief at rest and during motion" in the two groups, then why was more rescue

opioid analgesia required during the study period in the nonstimulating group?

6. Why was the femoral block placed? We can speculate that it might be for relief of tourniquet pain or to provide sensory loss in the distribution of the internal saphenous nerve.

7. When subjects experienced pain, where was it located? Could pain have been attributed to failure of the femoral block, leaving the distribution of the saphenous nerve sensate, rather than failure of the popliteal block?

8. Continuous popliteal block using the posterior approach may entail different technical problems linked to the durability of the catheter in this position in up to 25% of cases (3). Did the authors observe the same incidence and the same technical problems using stimulating and nonstimulating catheters?

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In Response:

We thank Dr. Navas for his observations (1) on our recent manuscript (2). Results of our prospective, randomized, blinded trial suggested that stimulating catheters can provide some minor advantages over nonstimulating catheters in continuous posterior popliteal sciatic nerve block. We agree with Dr. Navas that although the observed reduction in onset time was statistically significant, its clinical relevance is questionable. However, the use of a stimulating catheter reduced the amount of local anesthetic and rescue pain medication required to produce the same quality of postoperative analgesia as is provided with a nonstimulating catheter.

In our investigation the sciatic nerve was reached 10 cm proximal to the popliteal crease before the 2 main branches of the sciatic nerve divide. One explanation for the shorter onset time was that the final position of the catheter tip was closer to the nerve when direct stimulation through the catheter was used to identify correct positioning. In this study we placed the catheter at the stimulation of either the tibialis or common peroneal nerve. Even though Taboada et al. (3) demonstrated better performance when the tibial twitch was used instead of the common peroneal twitch, we were not able to find differences in results by stratifying for the twitch used for catheter placement. However, our study was not designed to answer this question.

The shorter onset time observed in the common peroneal distribution, as compared with the tibial distribution, may have been attributable to the different size of the two nerves. This agrees with findings reported by Taboada et al. (3).

The quality of pain relief was measured at fixed intervals. Both groups had adequate pain relief, and we did not observe differences in pain relief. However, patients with nonstimulating catheters achieved adequate pain relief by consuming more local anesthetic and more rescue tramadol. This could be evidence that the final position of the catheter tip was closer to the nerve with the stimulating than nonstimulating catheters. This hypothesis is supported by findings of Salinas et al. (4), who showed in volunteers that the minimum stimulating current through the catheter resulting in a proper muscular twitch was lower when the catheter was placed with a stimulation-guided technique than that observed after placing the catheter with a "conventional" blind technique.

The femoral block was placed for tourniquet pain and was not relevant postoperatively because the block dissipated quickly. Pain after surgery was related to the sciatic nerve distribution and not the saphenous one.