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## On the Use of Ophthalmic Ointment to Prevent Corneal Abrasions during General Anesthesia

*To the Editor:*—In their report on the use of ophthalmic preparations during general anesthesia, Siffring and Poulton<sup>1</sup> note a high incidence of blurred vision and decreased visual acuity after the use of petroleum-based ointments. The authors conclude that ophthalmic ointments should be avoided for routine short procedures. They maintain that their omission will not compromise safety.

Siffring and Poulton did not detect any corneal abrasions in the 127 patients studied. This complication appears to be a rare but extremely painful one.<sup>2</sup> Corneal abrasions have been noted after surgery even when the patient has been supine and the surgical field was not in proximity to the head. The problems noted would be considered minor if corneal abrasions were prevented by the ointment. To evaluate the efficacy of a technique to prevent corneal injuries, a large number of cases would be needed. In the absence of such a study, I plan to continue the routine use of ophthalmic ointment, as has been advocated.<sup>2,3</sup>

Siffring and Poulton have confirmed a previous investigation<sup>4</sup> which concluded that “. . . ointment is retained on the eye longer than other vehicles.”<sup>2</sup> This property may be precisely the one which will decrease the chance of a corneal abrasion occurring during gen-

eral anesthesia, since the production of tears is decreased during anesthesia<sup>5</sup> and eyes may open even when they are thought to be securely taped shut.

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*In Reply:*—In our report on the prevention of ophthalmic complications during general anesthesia, we did not detect any corneal abrasions in the 127 patients studied. A large sample size would be optimal to detect this rare complication, as has been suggested by Dr. Sosis. However, it is debatable whether the risk of application of ointment is warranted in procedures where the chance of corneal abrasion is low (*i.e.*, procedures of short duration, in the supine position and not involving the head). It should be noted that the use of ophthalmic ointments during general anesthesia does not preclude corneal abrasion. They can occur during the application of ointment to the eye. They may also occur as a direct result of foreign material contained in the oint-

ment. It has been noted by Dr. Sosis that ointment is retained in the eye longer; however, it must be reapplied every 90 min, allowing for an additional risk of corneal abrasion with reapplication.

In our study, we focused on anesthetic procedures of short duration with the patient in the supine position in surgeries not involving the head. We concluded that the elimination of the routine use of ointments for these procedures is reasonable in that no complications were noted, and that patients observed a significant decrease in postoperative visual complaints when compared to those using ointments. This factor may be significant in light of the increasing number of outpatient procedures. The elimination of ointments during long-term

procedures or those involving patients in the prone position has not been advocated by our study. In view of the paucity of research regarding this topic in the recent literature prior to this study, the use or non-use of ocular ointments during anesthetic procedures is left to the discretion of the anesthesiologist, depending on the circumstances surrounding each individual case. Still, it appears that, in short-term procedures, the elimination of the routine use of ophthalmic ointments is cost effective and allows for better postoperative patient satisfaction without compromising safety.

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### Modification of an Anesthesia Machine for Use during Magnetic Resonance Imaging

*To the Editor:*—Magnetic resonance imaging (MRI) is a non-invasive diagnostic imaging process that utilizes powerful electromagnetic field and radio frequency pulses to produce images. In order to obtain optimal studies, it is mandatory that the patient be absolutely still inside the scanner, which, if not possible, may dictate a need for general anesthesia. The administration of general anesthesia for MRI is complicated by the fact that the magnetic field interferes with the function of conventional anesthesia machine and electronic monitoring devices. Conversely, electronic monitors may interfere with the function of the scanner and degrade the image quality.<sup>1,2\*</sup> We describe the modification of a conventional anesthesia machine rendering it suitable for administering general endotracheal inhaled anesthesia within 2 feet of a 1.5 tesla MRI magnet. We also described the monitoring devices which we utilized in the MRI suite.

The commercially available anesthesia machines contain varying amounts of ferromagnetic substances and electronically controlled regulators making them unsuitable for use in the proximity of an MRI magnet. A Foregger<sup>®</sup>, Model BC anesthesia machine was modified and converted to a non-ferromagnetic machine. An examination of the machine using a small permanent magnet demonstrated the actual gas delivery portions of the machine to be non-ferromagnetic. The only ferromagnetic portions of the machine were the support structures, castors, oxygen and nitrous oxide tanks, and portions of the tank supports. Under the direction of

our bioengineers, a support cart with castors was manufactured using stainless steel and aluminum. Aluminum oxygen and nitrous oxide tanks were used instead of steel tanks. After inspection and certification for use by our bioengineering department, the unit was tested in the proximity of the magnet. It could be located within 2 feet of the magnet without magnetic attraction of the machine or degradation of the quality of the image. The total cost of the conversion was about \$1600.

Narco Air-Shields<sup>®</sup> ventilator (Model VC 20-1) is non-ferromagnetic, and was found compatible with the MRI magnet. We tested several monitors of different brands in the MRI suite, and found that physiologic monitoring for these procedures can be accomplished with the following monitors. Ohmeda<sup>®</sup> 5120 oxygen analyzer, plastic precordial and esophageal stethoscopes, blood pressure cuff, Parks Medical Electronics<sup>®</sup> (model 811) Doppler flow probe, Biochem (The microspan<sup>®</sup> 1040) pulse oximeter, and fibroptic ECG (Astro-Med<sup>®</sup> Model Dash II). To prevent image degradation, the Doppler box and the pulse oximeter box must be placed approximately 20 feet away from the magnet. Therefore, Doppler probes and pulse oximeters must be used with approximately 20-foot-long cords.

We have successfully used this modified machine with the previously described monitors in several children and adults.

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