

TABLE 1. Effect of Cardiac Rhythm and Pulse Deficit on Pulse Oximetry Accuracy

	n	SpO ₂ - %HbO ₂ *	SpO ₂ -(%HbO ₂ + %HbCO)†	P	Power‡
NSR group	134	0.4 ± 2.1	-2.7 ± 2.1	>.60	>.95
Non-NSR group	31	0.5 ± 2.0	-2.5 ± 2.4		
No pulse deficit group	139	0.8 ± 1.9	-2.8 ± 2.1	>.05	>.95
Pulse deficit > 3 group	24	0.3 ± 2.0	-2.2 ± 1.9		

* Mean ± SD.

† Two wavelength pulse oximeters recognize COHb mostly as %HbO₂.⁸ Adjusting for COHb did not alter the statistical significance. The mean COHb was 3.0 ± 0.8%.

‡ 1 - power = probability of a type II statistical error.

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A Circle System is Best when Anesthetizing Malignant Hyperthermia Susceptible Patients

To the Editor:—I read with interest the correspondence from Donahue and Schulz,¹ recommending a partial rebreathing system for malignant hyperthermia-susceptible (MHS) patients. They used this system to anesthetize a child, "rather than cancel the case or purge a machine," as was recently described by Beebe and Sessler.² They also recommend it as a standby system for pregnant MHS patients. While this system may perform adequately when anesthesia is uneventful, if an MH crisis occurs, this system might be unable to maintain normocarbia, at least in adult patients. There is no CO₂ absorber, and the fresh gas flow rate of the system is limited to 15-18 l · min⁻¹ by the N₂O/O₂ blender (personal communication, Bird Corp., Palm Springs, CA).

Rogers *et al.*³ have described a case of a 45-kg female patient who developed intraoperative MH while being anesthetized using a Bain circuit. The end-tidal CO₂ concentration could not be controlled until the Bain circuit was replaced with a circle system with a fresh CO₂ absorber. The authors recommended the circle system as the circuit of choice for MHS patients.

Although it is important to avoid volatile anesthetic agents in MHS patients, MH can occur during so-called "nontriggering" general anesthesia.^{4,5} Therefore, it is prudent to begin a case completely prepared to treat an MH crisis, including a "clean" machine with a CO₂ absorber, than to hurriedly try to obtain one once a reaction has begun.

This is especially true if one is not familiar with the purging method or when little help is available, e.g., weekends or nights. Purging the machine during an MH crisis diverts one's attention away from managing the patient.

The circle system with a CO₂ absorber is the circuit of choice in MHS patients, be it a purged machine² or a dedicated clean machine. The purge should take less than 10 min to perform. In facilities that do not have a dedicated clean machine, I suggest that the purging instructions and replacement tubing be kept on the MH treatment cart. Whether the system described by Donahue and Schulz is adequate to give an uneventful anesthetic is not the issue. It is just not the best that we have to offer.

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In Reply:—We appreciate the comments offered by Dr. Allen. Our system was designed for use in infants and children with indications of malignant hyperthermia susceptibility (MHS) (*i.e.*, an unexplained fever after a previous anesthetic, a questionable diagnosis of myotonia). These patients were coming to surgery for minor procedures (*i.e.*, inguinal herniorrhaphy, muscle biopsy, pressure equalization tubes). The system has worked well in these cases; however, as pointed out by Dr. Allen, none of these patients developed a malignant hyperthermia (MH) crisis.

The Bird Products Corp., Palm Springs, California, manufactures two nitrous oxide/oxygen (N₂O/O₂) blenders. A low flow model (No. 2903) that allows fresh gas flows (FGF) of 2–18 liters per minute (LPM) and a high flow model (No. 2902) with FGF of 15–100 LPM. The low flow blender was chosen because of the size of the involved patient population. In children less than 25 kg, our system would provide the increased minute ventilation recommended during an MH crisis without rebreathing.^{1,2} Use of their high flow blender in larger patients would eliminate the possibility of rebreathing in this group also.

We agree with Dr. Allen that, during an MH crisis, the breathing system must be able to deliver high flow oxygen. Many systems can do this. A high flow nonbreathing system may be advantageous because it would eliminate the rebreathing of exhaled volatile agents as well

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Electrocardiographic Lead Systems

To the Editor:—In their excellent study, London *et al.*¹ found that for the intraoperative detection of ST segment deviation, among the 12 standard electrocardiographic (ECG) leads, lead V₅ and then V₄ are the most sensitive. We would like to add that Kubota *et al.*² and others made similar observations in supine patients after treadmill exercise, suggesting that other findings from exercise testing may also be applicable to the perioperative setting.

Kubota *et al.*² studied ST changes in 87 body surface leads in 61

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as the heating of inspired gases by the exothermic reaction in the CO₂ absorber.

The avoidance of triggering agents, close monitoring, and a high index of suspicion are crucial when dealing with MHS patients. Our system is simple, portable, and clearly uncontaminated and we believe it has merit in this patient population.

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patients. After exercise, ST depression was evident in V₅ lead in 87% of the patients. ST depression occurred only in leads other than V₄, V₅, and V₆ in 10% of the patients. The most sensitive leads were V₅, V'₅, V₄, V₄, V'₆, and V₆, respectively. Leads V'₄, V'₅, and V'₆ are one interspace below V₄, V₅, and V₆, respectively.

Concomitant ST elevation was present in right upper chest leads in 74% of the patients. Of these, 87% had ST elevation at a location just below the right clavicle on the midclavicular line (R_C). Thus the most