spontaneous, clonus occurs during cold-induced thermoregulatory shivering. This indicates that at least one component of postoperative tremor is *not* normal thermoregulatory shivering.

Lawson *et al.* are also concerned about figure 2B, in which we present an EMG signal from a patient who is overtly shaking in contrast to a normal subject who is shivering. The point made by Lawson *et al.* is that the shivering signal seen in figure 2A does not resemble the EMG signals seen in the patient who is overtly shaking in figure 2B. This is exactly our point. They suggest that the signals illustrated in figure 2B could be the tonic stiffening of muscle as seen during a generalized seizure. There is no question that there is tonic stiffening in these patients. But it seems unlikely that our normal patients, who were often awake and alert, were having seizures.

Finally, the authors address the point that the data we presented on normal cold stressed shivering is derived from our single study and has been published only in abstract form. The paper titled "Synchronized slow amplitude modulations in the electromyograms of shivering muscles" is in press (Journal of Applied Physiology).

We would like to stress that the term "shiver" only describes thermoregulatory tremor in cold stressed subjects; it should not be used to explain or describe other overt oscillations. The etiology of a particular shivering-like tremor cannot be ascribed to thermoregulation without mathematical analysis of electromyographic signals combined with multiple temperature measurements.

Our study was a *first* attempt to quantitatively analyze postoperative tremor. As such as, interpretation of our results is subject to certain limitations—which were clearly stated in the text. The two most serious are that our patients were slightly hypothermic and that we didn't measure thermoregulatory vasoconstriction (because we had yet to develop a reliable method to determine peripheral blood flow in patients with vigorous tremor). Consequently, it is difficult to determine the extent to which postoperative tremor is thermoregulatory. Certainly, we agree that normal shivering can occur during recovery from general anesthesia, and specifically stated in our paper under which circumstances it is likely. It should also be obvious that patients who become sufficiently hypothermic during surgery to trigger thermoregulatory responses are likely to shiver postoperatively. However, it was clear from qualitative examination of the raw EMG signals that many did not have the characteristics of normal shivering. We are currently evaluating the extent to which these tremors are derived from other etiologies, including spontaneous clonus and *abnormal* (*e.g.*, spinally mediated) shivering.

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70:558–559, 1989

The Use of a Vinyl Glove Does Not Affect Pulse Oximeter Monitoring

To the Editor:—Recently Sloan[1] reported three cases of finger injury following use of an oxygen saturation monitor probe. To further minimize injury with an oxygen saturation monitor probe, we recommend placing a vinyl glove on the hand to which the probe is to be applied (fig. 1). This would at least decrease the chance of injury occurring from chemical or betadine contamination. We have not found the use of a vinyl glove to have an effect on the pulse oximeter reading.

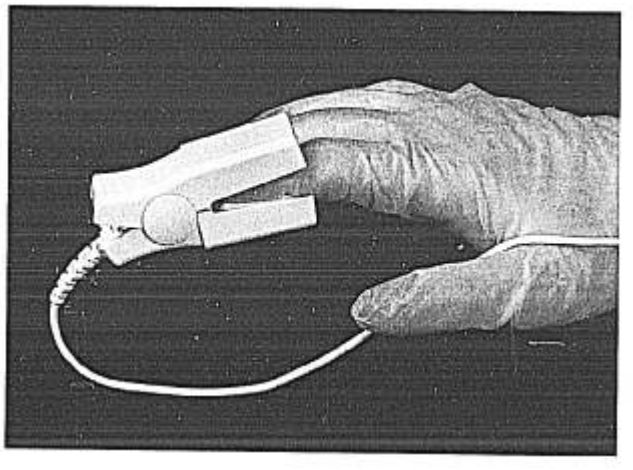

FIG. 1. Gloved hand with oximeter.

After obtaining institutional approval, we studied ten healthy female patients who had regional anesthesia for either cesarean section or postpartum tubal ligation to determine what effect a vinyl glove would have on hemoglobin and oxygen saturation readings determined by pulse oximetry (SpO_2). A Nellcor® oximeter probe was placed on the right index finger of each patient, and an SpO_2 reading was made after 2 min. A Travenol Triflex® vinyl examination glove was then placed on the patient's right hand, the pulse oximeter probe was again placed on the right index finger, and an SpO_2 reading was made after 2 min. There was no significant difference between the SpO_2 readings of the

TABLE 1. Oximetry Readings (SpO_2) With and Without Glove

	SpO_2%
Ungloved finger	98.0 ± 0.81
Gloved finger	98.2 ± 0.79

There were no significant differences between the two groups.

TABLE 2. Oximetry Readings (SpO_2) With and Without Glove in Patients with Decreased Arterial Oxygen Tension

Patient	PaO_2 (mmHg)	SpO_2 (%) Without Glove	SpO_2 (%) With Glove
Neonate	64.1	93	94
Neonate	58.2	93	93
Neonate	87.3	94	95
Adult (trauma)	51.6	79	80
Adult (trauma)	60.3	90	90
Mean	64.3	89.8	90.4

There were no significant differences between the SpO_2 groups.

gloved or ungloved index finger (table 1). Using a similar protocol, we further measured arterial blood gases and SpO_2 in three neonates and two adults with decreased Pa_{O_2} to determine if there was any interference by a vinyl glove in patients who have altered oxygenation (table 2). Again, the right index finger was used. A pediatric pulse oximeter probe was used on the neonates. We concluded that a vinyl glove does not interfere with SpO_2 readings. We routinely use the vinyl glove intraoperatively as we feel it lessens the chance of injury as reported by Sloan.

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EKG Artifacts during Intraoperative Evoked Potential Monitoring

To the Editor:—During intraoperative monitoring of somatosensory evoked potentials (SEPs), the EKG signal displayed on the screen of the Datascope 2000® monitor (Datascope Corporation, Paramus, NJ) was often obscured by large stimulus artifacts. The same artifacts appeared on "delayed" hardcopy output produced by the Datascope (fig. 1A), but not on "diagnostic" hardcopy output (fig. 1B). SEPs were recorded by a Nicolet Pathfinder I® signal averager (Nicolet Instruments, Madison, WI) using constant-current stimulators and stimulus isolation units. The square pulse electrical stimuli were 200 μsec in duration and delivered at a rate of 6.1 per second to paired stimulating electrodes over the median or posterior tibial nerves; stimulus intensities ranged from 15 to 30 mA.

Rigorous testing of the Pathfinder failed to demonstrate any malfunction. Other evoked potential averagers (*e.g.*, Lifescan®, Diatek, San Diego, CA) produced similar artifacts. We then discovered that the large artifacts were produced by a "pacer enhancement circuit" in the Datascope 2000®, which modifies data sent to the screen display and "delayed" hardcopy but not to the "diagnostic" hardcopy. This circuit increases the visibility of small pacemaker spikes by incorporating a high-amplitude square pulse in the EKG data when a pacemaker spike is detected. While the electrical artifacts from the somatosensory stimuli were not large enough to obscure the EKG by themselves, their steep slopes led to their identification as pacemaker spikes.

The "pacer enhancement circuit" of the Datascope 2000® can be disabled, eliminating this problem. Other EKG monitors designed for intraoperative use may also incorporate such circuitry. Thus, we are reporting our findings for others who may have encountered similar difficulties.

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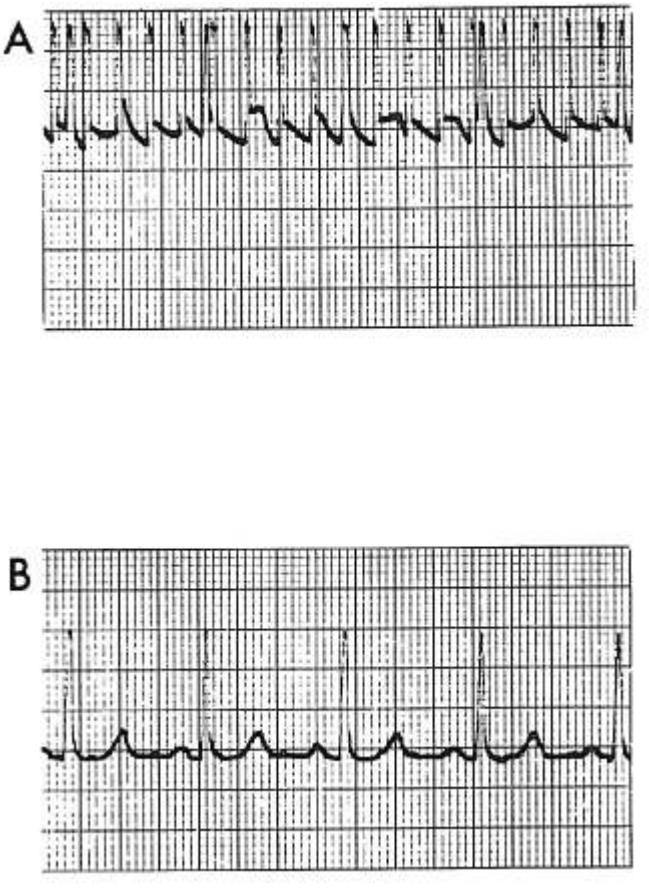

FIG. 1. "Delayed" (*A*) and "diagnostic" (*B*) hardcopy EKG tracings produced by a Datascope 2000® monitor during one operation. Identical somatosensory stimuli were being administered during both.