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Hyperthermia and Hypothermia as Complications of Extracorporeal Shock Wave Lithotripsy

To The Editor:—I read with interest the clinical report of accidental hyperthermia during extracorporeal shock wave lithotripsy (ESWL) as described by Higgins *et al.*[1] In my personal experience with over 1500 ESWL treatments over the last 3 yr, I have encountered two incidents of accidental hyperthermia under general anesthesia, with clinical presentation similar to the case reported by these authors. Following these two incidents caused by tub water temperatures in excess of 41.5° C, we have established a practice of checking the water temperature prior to immersion of the patients in water. It is not uncommon to find water temperature in excess of the recommended (35–37° C).

I have also seen one case of accidental hypothermia in a 32-yr-old otherwise healthy patient who received epidural anesthesia for ESWL for bilateral kidney stones. After establishing sensory level of T 4–5 and just prior to immersion, the water temperature in the tub was noted to be 42° C. Cold water was allowed to run in and, once the water temperature approached 38° C, the patient was immersed in water up to the clavicles and treatment begun. Approximately 20 min later, the patient complained of feeling extremely cold with chills. The tub water, which felt unusually cold to touch, was measured to be 19.5° C. The cold water had been inadvertently left running. The patient's oral temperature taken at this time was 34.4° C with the skin temperature of the great toe at 26° C. The cold water was rapidly drained from the tub and warm water was rushed in. Over the next 25 min, the patient's oral temperature had recovered to 35.8° C and shivering had ceased. The procedure was completed and there were no untoward sequelae.

For ESWL, since the patient is completely surrounded by the water excepting only the head and neck, it is understandable that the bath water temperature would have significant impact on the patient's body temperature. This is further enhanced due to the peripheral vasodilatation caused by either general or epidural anesthesia. Since the temperature of the inflowing water has to be manually adjusted on the lithotripter, the temperature of the water inflow as well as the bath temperature need to be checked frequently and adjustment made accordingly. Any oversight is likely to result in bath temperatures either too high (as in the case report of Higgins *et al.*) or too low (as in our case), predisposing the patient to hyperthermia or hypothermia, both potentially serious complications.

I suggest the following modifications to help decrease the likelihood of these events: 1) automatic regulation of water temperature to the thermo-neutral range, 2) placement of water temperature alarms to signal excessively high or low water temperature, and 3) relocation of the digital temperature readout to within the view of both the anesthesiologist and the urologist. Pending these changes, I concur with Higgens *et al.* in recommending that both patient and bath temperatures be monitored.

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Modifying the Fetal Monitor May be Hazardous

To the Editor—We would like to thank Doctors Van Zundert, Vaes, and De Wolf for their letter.[1] We have felt for many years that being able to monitor both the maternal and fetal heart rate during labor was clinically significant, so we pioneered the capability that we call "Dual Heart Rate Capability" on our 8040A fetal monitor.

However, there are several technical limitations to the proposal outlined in the article, that probably preclude it being clinically useful in the United States and elsewhere in the world. These are:

1) First, their proposal necessitates that there be abdominal ECG processing capability inside the HP

8040A monitor, which is typically not an option purchased in 98% of the monitors.

2) Modifying the cable necessitates a high voltage safety check, which is not possible in most hospitals. Failure to do so might constitute a patient safety problem.

3) Using the direct ECG electrode with the abdominal processing will not work in an unknown percentage of cases, as it assumes that the gain of the maternal signal is significantly higher than the fetal signal.

4) Such a modification, and any further repairs necessitated by the modification, would not be covered under the warranty on the product.

There are, however, two ways to monitor both the fetal trace and the maternal trace simultaneously on the 8040A fetal monitor without these technical limitations. One way utilizes ultrasound monitoring of the fetus, and the other utilizes abdominal ECG monitoring of the fetus:

1) *Ultrasound Monitoring.* The normal 8040A fetal monitor with dual heart rate capability has the ability to simultaneously record the heart rate of both mother and fetus, with the maternal signal supplied by a bipolar lead across the chest. It uses cable number 15241A, and is described in our 8040A operating guide on Page 15. You can tell if an 8040A is recent enough to have this capability, as it will have two blue input sockets, labeled "ECG" and "US." On a new fetal monitor, this is a no-charge option.

2) *Abdominal ECG Monitoring.* An 8040A fetal monitor with abdominal ECG capability can do what Doctor Van Zundert described, but uses a different cable to do so. In this case, both the maternal and fetal signal will be measured *via* an ECG signal, measured across the uterine wall. This procedure works on roughly 60% of all patients, due to the formation of the vernix caseosa acting to ground out the signal. This processing can be purchased for the monitor, as Option A01 to the 8040A.

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