Hyperthermia and malfunction of transesophageal echocardiographic probe

Sir,

Saluja *et al*. encountered transesophageal echocardiography (TEE) probe malfunction in a patient who developed fever.[1] The TEE probe stopped functioning when the TEE monitor showed a temperature of 42.5°C. TEE transducers have piezoelectric materials in which energy dissipation or energy losses are one of the most critical issues. If a piezoelectric element is heated to its Curie point, the domains become disordered and the element becomes completely depolarized. A piezoelectric element can therefore function for a long period without marked depolarization only at a temperature well below the Curie point.[2,3] A safe operating temperature would normally be halfway between 0°C and the Curie point. That is the reason for which heat sterilization of the probes should never be used because high temperature depolarizes piezoelectric crystals inside the probe and transducer loses its piezoelectric properties forever. Being in a high-volume cardiothoracic unit, we use TEE routinely as a real-time monitoring system in all the patients in operating room as well as in intensive care unit. The TEE transducer system has two levels of upper thermal limit: The first high limit is set at 41.0°C and the second high limit is set at 42.5°C. If the temperature of the transducer tip reaches 41.1°C, the temperature display turns reverse highlight and a warning appears (auto cool eminent) on a frozen images. This warning only appears once per examination. If the temperature reaches 42.5°C, the system freezes unconditionally. The user will not be allowed to scan until the temperature has decreased below 42.0°C. To restart scanning, the user must press the freeze key. The system has a lower thermal limit of 17.5°C. If the temperature of the transducer tip reaches 17.5°C, the temperature display turns reverse highlight and the system freeze unconditionally. The user will not be allowed to scan until the temperature has increased above 18°C. To restart scanning, the user must press the freeze key. The general guidelines for reducing the temperature in two-dimensional (2D) Doppler modes are as follows:

1. Increasing image depth reduces the transducer surface temperature
2. When imaging in color mode, there are no imaging changes that can reduce the transducer surface temperature

3. When imaging in pulsed wave Doppler, decreasing pulse-repetition frequency and/or positioning the Doppler sample gate to a shallower depth generally reduces the surface temperature
4. When imaging in continuous Doppler mode (CWD), increasing the depth of the CWD sample line (2D image depth before turning on Doppler trace mode) generally reduces the transducer surface temperature
5. In any imaging mode, freezing the image will temporarily reduce the transducer surface temperature.

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Conflicts of interest

There are no conflicts of interest.

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