Temperature Monitoring during Surgical Procedures

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Recommendation:

MHAUS recommends core temperature monitoring for all patients given general anesthesia lasting more than 30 minutes. Appropriate sites for continuous electronic core temperature monitoring include the esophagus, nasopharynx, tympanic membrane (with probe in contact with the membrane), bladder, and the pulmonary artery.

Background:

Malignant hyperthermia (MH) is an inherited pharmacogenetic syndrome that can be triggered by commonly used volatile anesthetic agents and/or succinylcholine (1,2). The phenotype is highly variable and a patient may receive a triggering agent without consequences and then, on a subsequent exposure, develop a full-blown MH crisis (1).

The prevalence of MH related to exposure to anesthesia has been estimated at 1 per 100,000 surgical inpatient procedures based on New York State hospital discharge data and 0.3 per 100,000 ambulatory surgery procedures based on New York and New Jersey ambulatory surgery data (3,4). Although MH mortality rates are low, they are not zero, and estimated to be 0.0082 per 100,000 United States surgical inpatients — thus constituting 1% of all anesthesia mortality for the years 1999 to 2005 (5). The North American Malignant Hyperthermia Registry of MHAUS has received reports of 12 deaths from MH in the US for the period of 1987 through 2012, 11 of which occurred in patients less than 46 years old. Mortality rates have increased from 1.4% of cases for the period of 1987 to 2006 to 9.5% for the period of 2007 – 2012 (6,7).

In a study of 84 MH patients, there was a significant association between mortality from an MH event and type of temperature monitoring present prior to the first sign of MH. The relative risk of death when temperature was not measured compared to core temperature measurement was 13.8. The relative risk of death when a skin temperature probe was used versus a core temperature probe was 9.7. Peak temperature best distinguished patients who survived from those who died (7). Economic analysis demonstrates that the economic risks of not monitoring with core temperature probes are easily outweighed by the economic benefit in lives saved (8). Failure to detect and treat temperature abnormalities increases the likelihood of MH complications 2.9 times for every 2°C increase in maximum temperature (1).

Interpretation:

Temperature elevation may be the first sign of MH, and can present within 30 minutes of anesthetic induction (1). However, core temperature perturbations during the first 30 minutes of anesthesia are difficult to interpret because of redistribution hypothermia (9). We therefore recommend core temperature monitoring for general anesthetics exceeding 30 minute, a recommendation that strikes a balance between thermoregulatory and MH studies (10).

Level of evidence:

Our recommendation is largely based on Level 3 or 4 evidence following the Oxford Center for Evidence Based Medicine' (www.cebm.net) levels of evidence. The infrequent and unpredictable occurrence of MH combined with the potential morbidity and mortality of an experimentally triggered MH event makes it unlikely that these issues will be able to be studied in a fashion that would produce higher levels of evidence.

References:

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