
CASE REPORTS

SURFACE WARMING-JUST BENEFITS, NO RISKS?

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Abstract

Hypothermia is known to be detrimental to patient outcome in peri-operative period. Prevention and treatment of hypothermia is very important and relatively simple. Among multiple devices and techniques, forced warm air units are widely popular in the United States. We present the case of a 6-month-old boy who suffered burns from the forced air warming during surgical repair of cleft palate.

Introduction

Patients undergoing surgery can experience hypothermia. The cause of hypothermia is multifactorial and includes cold OR, anesthesia-induced central thermoregulatory inhibition, redistribution of body heat and reduction of metabolic heat production. Children are at risk because of higher body surface to body volume ratio, higher proportional surface area of the head (major heat-dissipating area) and less body fat. Multiple studies show that perioperative hypothermia is harmful, negatively affecting patient comfort, recovery time, wound healing, coagulation function and drug metabolism. Hypothermia increases oxygen consumption, oxygen debt and results in metabolic acidosis, increases chance of surgical site infection, chance of adverse cardiac events, increases blood loss and transfusion requirements^{1,2,3}.

There are several ways to maintain normothermia. Ambient room temperature could be increased. Different devices such as heat and moisture exchangers, fluids warmers, isolation blankets, isolation padding, warm water circulating mattresses can be utilized. However, forced air-warming systems, available since 1988, are often the method of choice since they are simple, effective, inexpensive and essentially risk free and have been shown to improve patient's outcomes in various surgeries (spine, cardiac, orthopedic)^{4,5,6}.

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Case Presentation

A 6-month-old 8.9 kg infant with unremarkable history except for cleft palate presented for an elective repair of cleft palate. Physical exam was unremarkable. The child had uneventful general anesthesia with sevoflurane, isoflurane, propofol, fentanyl and vecuronium. The surgery took approximately 70 minutes and patient was under general anesthesia for about 90 minutes. To avoid hypothermia and maintain normal temperature, small lower body blanket was used. The blood pressure and heart rate remained within normal values during the intra-operative period with no hypotension or bradycardia. During the operating room time, the esophageal temperature increased from 35.8°C to 37.6°C at the end of the case with forced air warming (Bair Hugger – model 505) set at 43°C. After drapes, blanket and small lower body Bair Hugger blanket were removed, patient was noted to have small, round red marks in a linear pattern on both lower extremities (Figs. 1 and 2).

Marks varied in diameter, blanched under pressure. Diagnosis of first degree burn was made. The Bair Hugger unit was removed from service, inspected, and found to be functioning properly.

Fig. 1



Discussion

Maintaining normothermia affects patient outcome and now is a standard of care. Forced air warming system is widely used, but complications of its use (listed in manufacturer's instruction) are rather poorly known to the most anesthesiologists.

Heat produced by forced air units is distributed over the body and removed by local skin flow and redistributed to the rest of the body. Therefore, if the circulation is impaired, heat can accumulate and can result in thermal burns. Conditions such as application of aortic cross-clamp, poor perfusion, low cardiac output (CO), vascular disease, patient's immobilization, poor cutaneous perfusion can result in thermal injury to the skin^{7,8}.

In order to minimize the risk of thermal insult, one should address the underlying problem such as low CO or poor perfusion and consider placing the warming blanket over an area of the body not affected by poor perfusion. One can also place an additional blanket between forced air blanket and the patient in addition to decreasing the forced air temperature to 38°C to make this therapy safer.

Fig. 2



Conclusion

Although hypothermia is detrimental to patient's outcome and deserves prevention, its treatment may also put patients at risk. In patients undergoing surgery, all possible measures should be utilized to

maintain normothermia. Forced air warming is most commonly used due to its simplicity, efficacy, and low risk. Thorough consideration should be applied to its appropriate use in patients with possible contraindications.

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