Cautery and Thermal Mattress in Cardiac Surgery

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Abstract

Water circulating thermal mattress is generally used during cardiac surgery to maintain patient’s intraoperative temperature. Use of cautery in such cases can be potentially hazardous in absence of proper precautions. The present case described the complication in such scenario.

Keywords: Cardiac surgery; Cautery; Burn injury; Thermal mattress

Introduction

Patients undergoing Off Pump Coronary Artery Bypass grafting (OPCAB) surgery are more prone to intraoperative heat loss due to an open thorax and exposed extremities for harvesting vascular conduits. Anesthesia induced vasodilation causes redistribution of heat from central compartment to peripheral tissue with further heat loss. In OPCAB, normothermia is generally preferred. Hypothermia affects the metabolism of anesthetic drugs and muscle relaxants with resultant effect of delayed tracheal extubation with prolonged recovery [1]. Hypothermia induced postoperative shivering cause rise in metabolic rate and vasoconstriction with increased after load and myocardial ischemia [2,3]. This would potentially lead to deleterious perioperative cardiac morbidity. Hypothermia can also cause coagulopathies, postoperative bleeding and surgical wound infection [4]. Hence, to prevent hypothermia, active thermal measures are suggested like airway heating and humidification, warm intravenous fluids and cutaneous warming devices such as circulating-water mattress. Here we report a hazardous complication of cautery in presence of defective warming device.

Case Presentation

A 58 year old gentleman presented with retrosternal chest discomfort on moderate activities. He underwent coronary angiography which revealed triple coronary vessels disease. He was scheduled for off pump coronary artery bypass grafting surgery. Radial artery was cannulated under local anesthesia. After uneventful anesthesia induction and intubation, central venous catheter was inserted. For surgical cutting and dissection, we use monopolar cautery with patient return electrode or grounding pad was placed on patient’s back. Left internal thoracic artery was harvested and anatomized with left anterior descending artery. Saphenous venous grafts were anatomized to obtuse marginal and posterior descending artery. Intraoperatively we intend to keep normothermia during off pump coronary bypass surgery. For this purpose, we use fluid warmer and circulating water mattress underneath. After five hours of uneventful surgery, patient was shifted to Intensive Care Unit (ICU). While shifting the patient, circulating water mattress was seen to be leaking with wet operating table. In ICU, scalding burn injury was observed on patient’s back skin. It was managed conservatively and healing occurred in seven days.

Discussion

Room temperature is one of the most important factor in regulating heat loss by radiation and convection. Passive insulation to the skin surface is easy method in reducing cutaneous heat loss. However passive insulation alone is hardly enough to keep patient normothermic intraoperatively. Active warming such as circulating-water mattress (as in the present case) and forced-air devices are effective in reducing heat loss. Even though forced air warming device is one of the most effective warming device intraoperatively, its use in cardiac surgery is not feasible. Electrosurgical cautery unit generates electrosurgical current which travels to the active electrode for cutting and coagulation. The circuit is completed as the current returns to the active electrode through the grounding pad or patient plate. Precautionary measures should be exercised while applying this grounding pad to avoid unwanted burn injury [5]. Grounding pad of cautery should be placed over body area with good vascularised muscle mass and as close to the surgery site as possible. Muscle contains water which is a good conductor of electricity. Bony prominences and adipose
tissue should be avoided for placement of the grounding pad as these tissues contain very little water and so impedes the flow of electricity. One should be cautious while applying grounding pad on lean, thin and cachexic person. Placement of pad near surgical site allows least amount of distance to travel by current. This also decreases the risk of the current exiting through an alternative way.

Neither part of patients body should be in contact with metal (even Metal jewellery) which can provide alternate path of electricity travel and can result in burn [6]. Also ECG monitoring electrodes should be placed away from the surgical site as the current can follow the alternate and least resistance pathway and has been reported to cause burn [7,8]. Such burn can be dangerous due to focused current. Grounding pad should not be placed over a tattoo as tattoo inks contain metals with potential heating of the tissue [9].

Skin preparatory liquid solutions must be prevented to pool around or leak under the grounding plate. This can result in failure of adherence of grounding pad to skin and can potentially burn the skin due to prolonged contact. This is especially dangerous when inflammable preparatory agents like tinctures and alcoholic solutions are used with risk of surgical fire [5]. However in the present case, leaking circulating mattress spreads water underneath patient’s back. This water in contact with grounding plate of electrosurgical cautery unit (Valley lab Force FX ESU - Covidien, USA) got heated and caused scalding burn injury over patient’s back.

References
5. Standard Electrosurgery.