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Intraabdominal Fire during Emergency Laparotomy

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Introduction

Surgical Fires are rare yet serious events that can occur in the operating room. An estimated 600 OR fires occur annually, with nearly 10% causing serious injuries or even death. The risks of a surgical fire are evaluated in the operating room during the surgical “Time Out.” Those present are surgeons, circulator RN/tech, and anesthesia providers. The elements required for a fire are an ignition source, an oxidizer, and fuel. Patients undergoing surgeries above the xyphoid are categorized as being at increased risk of experiencing a surgical fire. However, those patients with free abdominal air are often overlooked during the surgical time out and could potentially be high fire risks due to methane and hydrogen rich native intestinal gasses and/or supplemental oxygen or nitrous oxide administered to maintain oxygenation.

Case Report

72 y/o obese male presented to outside hospital with a 2 day history abdominal pain: sharp, radiating to bilateral upper quadrants, complicated by n/v/constipation. Patient took entire bottle magnesium citrate, only causing pain to become unbearable. On arrival SaO2 was 88% RA, all other vitals stable, Lactic Acid 1.85 mg/dl. Abdominal CT showed evidence of massive free air in peritoneal cavity, suspected perforated diverticulum. Pt transferred to our facility via ambulance, awake and conscious, vitals stable, O2 sat 93% on 2L nasal cannula. Pt taken to OR for exploratory laparotomy. Pt was preoxygenated on 10L 100% O2. RSI induction: propofol 1.5 mg/kg, rocuronium 1.2mg/kg. Intubation using Miller 2 blade and Size 8 ET tube was uneventful. A mixture of sevoflurane, 50% Oxygen with Air at 2L flow initiated for maintenance. Patient prepped with chlorhexidine and draped, as standard. Surgical Time Out performed including the fire risk assessed to be low. Surgeon incised skin after 5 minute drying time and then dissection was carried out through subcutaneous tissue using an electrocautery device. The peritoneum was then entered with the electrocautery. Immediately, a ball of flame burst from the patient’s abdomen. Surgery team backed up and anesthesia could feel a flash of heat. Before the team had time to react the flame vanished. Patient and field where inspected for signs of thermal injuries. All tissues and drapes appeared to be intact. Surgeon’s eyebrows where slightly singed, no other injuries sustained by patient or staff. Patient remained hemodynamically stable. The team determined the patient was not at risk of recurrent fire, and the surgery proceeded without incident.

Discussion

A fire in the operating room is a dreaded “never events” in the operating room. Extra care should be taken when cases have increased risk for fire. It is imperative the operating room staff consider all elements of the “Fire Triad” specific to each case prior to starting surgery. Those elements are: oxidizers, ignition and fuel. Oxidizers are oxygen rich gasses: oxygen and nitrous oxide. Ignition sources are electrocautery, high speed drills, lasers, etc. Fuel are patient tissue and intestinal gasses, surgical drapes and dry laps, endotracheal tubes and so on. Over 80% of operating room fires occur above the xyphoid. High fire risks are regularly assessed at time out in operating rooms across the nation, during cases such as tracheostomies, port placements/removals, oropharyngeal and facial surgeries. Additionally, 90% of OR fires involve electrocautery.

Abdominal fires have been reported a couple dozen times, and include open laparotomy cases. The risk of fire during such cases is increased by the presence of combustible gasses native to the intestinal tract. These gases are often eliminated by the additional of mechanical bowel preparations. However, in the setting of an emergency case proper bowel preps are not possible.

Our patient with a likely perforated bowel, free intrabdominal air, transferred from an outside hospital on supplemental oxygen, undergoing a laparotomy was at an increased risk for intraoperative fire but this was not noted in the surgical time out.

Conclusion

We describe a case of a 72 y/o male with perforated intestine and massive free abdominal air who underwent emergency laparotomy with a surgical fire complication. Induction of general anesthesia with endotracheal intubation was performed without complications. Surgical time out did not thoroughly evaluate the risk of fire to include the combustible intrabdominal free air. Upon opening the abdominal facial plane the surgeon switched from blade to electrocautery. This fire could have been avoided had sharp dissection rather than the electrocautery been used to enter the peritoneum.

Additionally, had the surgical time out assessed fire risk correctly, there would have been ample normal saline on the field to extinguish the flames. Thankfully the large flame that erupted from the patient's abdomen quickly dissipated and no injuries occurred.

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