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Case Report

Benzine as fire source in operation room

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Abstract

Provide a safety anesthesia to patient is only possible with the knowledge of material surrounding the operation room. Benzine is highly flammable substance and can produce several injures without the necessary care. This case describes a small fire caused by the presence of benzine in the surgical field concomitant with the use of electrocautery, which caused slight burns to the patient, but which could have been catastrophic, and proposes the use of protocols to prevent such accidents.

Introduction

Situations involving fire in the operation room (OR) are potentially dangerous and important due to their preventable nature and possible sequel to patients [1-3]. The incidence of fire in the OR has decreased since the introduction of less inflammable inhaled anesthetics and improvements in technology. Estimates in the US indicate that around 550 to 650 sparks or begins of fire situation occurs each year, resulting in around 20 to 30 patients being severely injured [1,2,4]. Associations such as the American Society of Anesthesiologists (ASA), the Anesthesia Patient Safety Foundation (APSF) and the Food and Drug Administration (FDA) have released over the last three years recommendations and guidelines for preventing accidents with fire, always focusing on removing situations where fuel sources (surgical drapes, towels, skin antiseptics, masks, hair), oxidizers (oxygen, nitrous oxide) could interact with ignition sources (electrocautery, lasers, fiber-optic light sources and cable) [5-8]. Special attention must be given to the anesthesiologist's role when providing supplementary gas, which could lead to an increased oxygen concentration in the environment. This situation makes fire self-sustaining and increases the spread rate. Another point of interest is the surveillance related to possible fuel source material in the OR, for example alcohol-based antiseptics [9]. The present report aims to expose the ingress of flammable substance in the OR, in this specific case benzine.

Case Report

A male patient, 43 years old, who was an alcoholic, smoker and drug addict (cocaine abuse two weeks before), was brought to the emergency room with myiasis in the left inferior member. The surgery team indicated removal of the larvae in the OR. The next day, the patient was transported to the OR, venoclysis was obtained, and then the anesthesiologist proceeded to spinal anesthesia with 10 mg of hyperbaric bupivacaine 0.5% and sedation with 5 mg of midazolam and oxygen was delivered through a nasal cannula at 2 L/min. The patient was placed in the supine position, with the right leg covered by surgical drapes, and the infected member was cleaned with antiseptic. The surgery began with the larvae being removed and disposed in a sterile recipient with benzine, without the knowledge of the anesthesiologist. At some point, the surgeon, aiming to stop a small bleed, activated the electrocautery, and ignited a small spark, which was enough to set fire to the steam released by the benzine next to it. Instinctively, the surgeon pulled the surgical drapes away from the patient, although flaming benzine has splashed onto the patient's left foot and his inguinal region, as well as in the surgeon himself. The anesthesiologist stopped the delivery of oxygen and turned off the electrocautery and the nurse returned with someone

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from the fire control team who used the carbon dioxide extinguisher, controlling the situation in less than 1 minute after the beginning.

Discussion

In their most recent guidelines, the ASA and APSF highlight the importance of avoiding having fuel sources, means of ignition and oxidizers together at the same time. Benzine surprised surgery team with its properties. Benzine, also known as petroleum ether, is a mixture of hydrocarbon with five or six carbon petroleum distillates, and a volatile (vapour pressure 31 kPa at 20 ºC, boiling in the range of 35–60 ºC), clear, colourless and non-fluorescent liquid [10]. This petroleum ether is highly flammable, with low vapour pressure, and must be avoided in the OR. In this case, the failure was the entry of this flammable material in the operating room, concurrently to the use of the electrocautery. It is important to remember that time to burn and spread of fire are closely related to oxygen concentration, therefore they must not be analyzed separately [9]. Within this topic, recommendations about respecting the correct time before antiseptic solutions are used on the skin must be followed [1,5]. Another important point to remember is that the oxygen supplementation carried out by the anesthetist should be done in a rational way, aiming at saturation above 92%. Some guidelines preach no supplementation of oxygen in every anesthesia, followed by air supplementation, then 30% oxygen supplementation [5,6]. If higher concentrations of oxygen are necessary, other methods should be considered, such as a laryngeal mask or endotracheal tube. The location of surgery brings some additional cares, in this case, those situated above the intermamilar line. When there is a need for electrocautery or other energy source, it is extremely important to make sure that the oxygen concentration in the area is below 30%.

Fire Risk Assessment Tool is described by Spruce L and is compounded by 5 questions that may be answered before starting the surgical procedure [11]:

a. Is an alcohol-based skin antiseptic or other flammable solution being used perioperatively?

b. Is the operative or other invasive procedure being performed above the xiphoid process or in the oropharynx?

c. Is open oxygen or nitrous oxide being administered?

d. Is an electrosurgical unit, laser, or fiber-optic light being used?

e. Are there other possible contributors (e.g. defibrillators, drills, saws, burrs)?

In our view, every institution should organize a protocol as the *Fire Risk Assessment Tool* to make fire prevention a daily occurrence in every surgery, and fill their databases to adapt the guidelines to local realities [11]. We must have emphasize the importance of maintaining a periodically trained fire control team in all sectors of the hospital [1, 2]. This case report aims to register an unusual complication that occurred in our service, draws attention to the physicochemical qualities of benzine and proposes a quick review of fire prevention.

Conflict of Interests

This report contains no conflict of interest. All support was provided by Anesthesiology Department of Hospital das Clínicas da FMUSP and Surgery Department of Hospital Universitário da USP.

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