



H149 The Tale of an Operating Room Fire Fatality

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Learning Overview: After attending this presentation, attendees will understand the incidence, etiology, features, and consequences of Operating Room (OR) fires.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by educating medical examiners and forensic investigators about key features of OR fires, guiding the incident investigation and autopsy, and stressing the importance of interagency cooperation in the investigation.

On January 6, 2015, the fire department was contacted about an OR oxygen flash fire. Saline was used to douse the fire with minimal room damage. Fire investigators advised securing the OR until their inspection the next day. Upon arrival, the OR had been cleaned. A bed and pillow present showed burn marks. Items from the trash were retrieved. It was then reported that a patient was involved and had expired. The fire chief, hospital president, and police department were notified, and a detective was assigned.

At that time, the case was reported to the Tarrant County Medical Examiner's Office (TCME). The body was retrieved from a funeral home, and an autopsy was performed on January 8, 2015. On January 12, 2015, materials from the OR were received, including an orogastric tube, corrugated plastic tubing, oxygen face mask, blanket, plastic fragment, black strap, hospital gown, black covered foam, foam head rest, and two pillows with variable thermal damage and soot deposition in the face mask.

The patient's medical history included chronic obstructive pulmonary disease, amiodarone-related lung toxicity, hypertension, hyperlipidemia, diastolic heart failure, abdominal aortic aneurysm, gastroesophageal reflux disease, diverticulosis, and chronic anemia.

She presented to the hospital in December 2014 with abdominal pain due to diverticulitis with a small bowel obstruction and pelvic abscess and underwent small bowel resection with anastomosis on December 16, 2014. She developed respiratory failure requiring intubation, pneumonia with sepsis, acute kidney injury, and atrial fibrillation. She was extubated yet required 100% oxygen on BiPap, necessitating a tracheotomy in the OR.

The patient was wearing a Phillips® Respiration Fitlife full-face mask with a nasogastric tube coming out from under the mask with 100% oxygen flowing when Bovie electrocautery was used for the tracheotomy, causing the oxygen flowing through the mask to catch fire, leading to burns of the head, neck, right shoulder, and airway. It was not specified in the OR note if monopolar or bipolar diathermy was used. An emergent cricothyrotomy was performed; she failed extubation trials and expired later the same day after withdrawal of care.

There are multiple published reports of OR fires, estimating that 600-700 OR fires are reported each year, with many more unreported.¹ The most common situations include use of laser or cautery with an endotracheal tube, but any high oxygen concentration situation is a risk factor.

Recommendations by the American Society of Anesthesiologists Task Force on Operating Room Fires include use of diathermy, reduce build-up of oxygen beneath the surgical drape, and turn off oxygen one minute prior to using laser or cautery, with open communication between surgeon and anesthesiologist.² If a fire occurs, disconnect the oxygen supply, use a saline wash, and remove the cautery device. It is recommended to never use electrocautery when FiO₂ levels are greater than 50%.³ CO₂ flooding of the surgical field can decrease the risk of fire in patients who cannot tolerate ventilation interruption.

The fire triad consists of fuel (tube/mask), oxidizing agent (oxygen), and ignition source (laser or electrocautery). OR fires are seen most commonly in head and neck surgeries and are less common now that less flammable anesthetic agents are used.

Findings at autopsy included thermal injuries of the head, neck and right shoulder, as well as the upper airway, in addition to emphysema, pneumonia, atherosclerotic cardiovascular disease with right ventricular dilatation, nephrosclerosis, diverticulosis, lymphadenopathy and splenomegaly. Toxicology was not contributory. The death was ruled an accident due to acute upper airway thermal injury due to medical equipment fire with chronic obstructive pulmonary disease, pneumonia, and hypertensive atherosclerotic cardiovascular disease with heart failure as contributory conditions.

The family filed a civil lawsuit against the surgeons, anesthesiologist, anesthesiology group, president, and vice president of the hospital as defined in the Texas Civil Practice and Remedies Code Section 74.001. The case was settled out of court for an undisclosed amount of monetary damages.

Reference(s):

1. Navaid Akhtar, Farrukh Ansar, Mirza Shahzad Baig, and Akbar Abbas. Airway Fires During Surgery: Management and Prevention. *Journal of Anaesthesiology and Clinical Pharmacology* 32 no.1 (2016 Jan-Mar): 109-111, doi:10.4103/0970-9185.175710.
2. J.L. Apfelbaum, R.A. Caplan, S.J. Barker, R.T. Connis, C. Cowles, J. Ehrenwerth, et al. Practice Advisory for the Prevention and Management of Operating Room Fires: An Updated Report by the American Society of Anesthesiologists Task Force on Operating Room Fires. *Anesthesiology* 118 (2013): 271-90.
3. Kmyung-Su Kim, Jang-Hoon Lee, Dong-Hyup Lee, Young Uk Lee, and Tae-Eun Jung. Electrocautery-Ignited Surgical Field Fire Caused by a High Oxygen Level during Tracheostomy. *Korean Journal of Thoracic Cardiovascular Surgery* 47 no. 5 (Oct 2014): 491-493.

Operating Room Fire, Electrocautery, Fire Triad