NIOSH Health Hazard Evaluations Related to Surgical Smoke

Does your facility evacuate surgical smoke during procedures in which smoke is produced? Do you experience health effects that could be a result of surgical smoke exposure?

In 2006, the National Institute for Occupational Safety and Health (NIOSH) received two confidential requests for health hazard evaluations. One was from a hospital in Virginia and the other from a hospital in Florida. Both evaluations were requested because of employee concerns regarding health effects from exposure to by-products of surgical smoke.

In both cases, over a 3-day period, air samples were collected and tested during surgical procedures in which electrocautery was used. In both cases, measurable levels of formaldehyde, acetaldehyde, and toluene were found in the air; however, the levels of these compounds were below the relevant criteria for occupational exposure. Employee surveys were conducted with regard to the symptoms the respondents believed were related to surgical smoke exposure. In one facility, 44% of the employees surveyed reported having at least one symptom they believed to be secondary to surgical smoke exposure. In the other facility, 52% reported such symptoms. The employees’ symptoms included headaches and irritation of the eyes and upper respiratory tract after exposure to surgical smoke. A greater percentage reported annoyance with the odor from the surgical smoke.

As a result of the evaluations, both facilities implemented engineering controls during surgical procedures in which surgical smoke is generated. In addition to general room ventilation, personnel employed NIOSH-recommended ventilation techniques, including the use of local exhaust ventilation as close to the point of smoke production as possible. They were also instructed to report to the facility’s occupational health staff or the employee health nurse any further health symptoms they thought to be related to surgical smoke exposure.

The conclusion of both evaluations was that, although the levels of the toxic compounds were below the relevant criteria for occupational exposure, the low concentrations of these compounds were sufficient to cause irritation of the eyes and mucous membranes. These symptoms were more prominent in sensitive individuals. Nearly one-half of all the employees surveyed reported at least one symptom they felt was associated with exposure to surgical smoke.


Copyright © 2016 AORN, Inc. All rights reserved. Used with permission.
Possible Transmission of Human Papillomavirus (HPV) via Laser Plume

Could surgical smoke exposure put surgical team members at risk for developing cancer?

Two gynecologic surgeons were diagnosed with HPV-positive oropharyngeal cancer. The first was a 53-year-old male surgeon who was found to have HPV tonsillar squamous cell carcinoma. He had long-term exposure to laser smoke plumes from performing laser ablations and loop electrosurgical excision procedures (LEEP) during more than 20 years of practice. Most of these procedures were performed in an area that did not have proper ventilation and with the surgeon not wearing appropriate respiratory protection. He had no other identifiable risk factors for oropharyngeal cancer or HPV. The second surgeon was a 62-year-old man with a 30-year history of performing laser ablation and LEEP procedures who was diagnosed with HPV-positive tongue cancer. He too had no other risk factors for oropharyngeal cancer or HPV infection. He reported that the area of the clinic in which he worked had poor ventilation. The report authors suggested that HPV transmitted through laser smoke plume was the probable cause of these cases of oropharyngeal squamous cell carcinoma.

Tissue destruction from a carbon dioxide (CO2) laser produces a gaseous plume that contains cell contents and other aerosols. The CO2 laser is most commonly used to excise lesions on the larynx, cervix, and genital tract. Some HPV subtypes are oncogenic, thereby potentially putting perioperative personnel at increased risk of developing oropharyngeal cancer from exposure to laser plume smoke.

TAKEAWAY

Because HPV may be transmitted through laser plume, it is prudent to reduce long-term occupational exposure to laser plume. Local exhaust ventilation should be used in addition to general room ventilation, and personnel should wear respiratory protective devices. In addition, HPV vaccination may be beneficial against oncogenic HPV strains. This may prevent infection as well as reduce the risk of developing oropharyngeal cancer.

References