Electrosurgery Smoke: A Serious Threat to the Health of Surgical Team Members in Iran

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Dear Editor

An electrosurgery device is among the most commonly used and essential Components of equipment in operating rooms. Over 80% of surgeries today depend on the frequent use of electrosurgery devices. This device uses high-frequency electric currents to create enough heat for hemostasis in surgeries.[1] When the electric current encounters resistance from the target tissues, it produces heat and therapeutic effects. This therapeutic effect is applied by cutting and coagulating, or a combination of both, to the subcutaneous tissues, muscles, fascia, and other body tissues during surgery.[2, 3] The components of the electrosurgery device include an active electrode, return electrode, and generator. This device's mechanism of operation is that the generator's electric current enters the target tissue in the patient's body using an active electrode and returns to the generator through the return electrode connected to the patient's body.[4] A major advantage of electrosurgery devices is providing a blood-free surgical site which gives surgical team members a better view of the site and thus reduces the length of surgeries.[2, 3]

The smoke caused by cutting or coagulating tissue with an electrosurgery device is called electrosurgery smoke.[1] According to a report issued by the Occupational Safety and Health Administration, about half a million members of surgical teams are yearly exposed to the hazards of electrosurgery smoke.[5] Studies show that there are more than 80 toxic chemicals in electrosurgery smoke, such as benzene, hydrogen cyanide, formaldehyde, acetaldehyde, butadiene, polycyclic aromatic hydrocarbon, etc.[6-8] In addition, studies report a direct relationship between exposure to electrosurgery smoke and various physical illnesses, including headaches, acute and chronic respiratory diseases, skin inflammation, eye diseases, digestive disorders, bacterial and viral infections, and possibly SARS-COV-2019.[6, 7] Among the diseases transmitted by electrosurgery smoke, respiratory diseases, leukemia and viral diseases, including hepatitis B (HBV), hepatitis C (HCV), human immunodeficiency virus (HIV), and human papillomavirus (HPV), pose the greatest threat to surgical team members.[2] Furthermore, according to Khajuria (2013), the smoke of burning 1 gram of tissue with an electrosurgery device has the same mutagenic potential as 6 unfiltered cigarettes.[9] However, on average, members of surgical teams are exposed to electrosurgery smoke 7 hours a day, 7 days a week.

Dobrogowski et al. (2013) report that frequent exposure to electrosurgery smoke increases the risk of suffering the Complications of the toxic chemicals in the fumes and is potentially carcinogenic, mutagenic, or genotoxic.[10] Nonetheless, Khoshdel et al.[11] and Fereidouni et al.[2] Conducted research in 2014 and 2021 in Iran. They showed that surprisingly, members of surgical teams have poor awareness of the consequences of electrosurgery smoke and the diseases it can transmit.

According to the Association of Perioperative Registered Nurses (AORN) and the National Institute for Occupational Safety and Health (NIOSH), the best way to avoid inhaling electrosurgery smoke is to use advanced protective equipment in operating rooms. This equipment includes electrosurgery smoke extractors, suction devices with smoke absorber filters, and high-filtration respirators, e.g., the N95 respirator, which must be used when surgical teams work with electrosurgery devices.[12]

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If perioperative team members do not use a smoke evacuator, they should wear a fit-tested surgical N95 respirator as a secondary line of defense against electrosurgery smoke.[13] However, Fereidouni et al. found that protective equipment was not used in many surveyed hospitals.[2] Employers have to create a safe and healthy work environment for all the operating room personnel.

As a serious threat to the health of the members of surgical teams, electrosurgery smoke can lead to various diseases that adversely affect the performance of surgical teams and increase medical costs for the personnel and the healthcare system. Therefore, steps must be taken to minimize these consequences. To prevent or reduce the Complications of electrosurgery smoke, researchers recommend using filtered masks,[12] fume extraction systems, personal protective equipment (PPE), and high-capacity ventilation systems.[2] They also recommend raising the awareness and knowledge of surgical team members through educational workshops and educating the heads of hospitals and operating room administrators about the significance of using appropriate ventilators and standard masks.

Keywords: Electrosurgery smoke, Operating room, Surgical smoke, Nurse

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