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A simple way to improve the safety of the surgical field

Occupational safety in the operating room is a topic of primary importance.

Electrocoagulation produces fumes that contain tiny particles, which can travel considerable distances from the place where the fumes are generated, becoming deposited in the pulmonary alveoli.

Previous works have demonstrated that the fumes produced in the operating room pose a serious risk to hospital employees working in the room. The noticeable odour of the plume is caused by toxic gases that may be carcinogenic. The only way to manage these fumes in the operating room is to remove them completely.

We have developed and adopted a simple and easily reproducible method to improve the safety of the operating room.

The amount and content of the fumes produced varies according to the procedure and is influenced by the type of instrument used, the type of tissue being treated and the disease involved, the type and intensity of energy generated, and the technique involved.

The chemical composition and biological properties of the fumes produced by the electrocoagulator have been studied in various works, which have demonstrated that they contain several chemical substances, some of which are present in considerable quantities (phenols, hydrocarbons, nitrites).^[1]

Previous works have demonstrated that fumes produced in the operating room pose a serious risk to hospital employees: The odour of the plume is caused by toxic gases that may be carcinogenic.^[2,3] The particulate matter carried in the plume is extremely small in size and can cause respiratory problems when inhaled.

In surgical smoke, furfural, commonly used as a solvent in the petroleum industry, can be detected. Its occupational exposure limit is 2 ppm.^[4] In surgical smoke, the measured concentration of furfural is 24 ppm.^[4] Several studies on little animals showed liver damage, adenomas and carcinomas after inhalation of furfural. In humans, furfural causes skin irritation, dyspnoea and headache in concentrations between 1.9 and 14 ppm.^[5] Generally, surgical smoke can cause eye irritation, headache, nausea, acute or chronic inflammatory respiratory changes, asthma, chronic bronchitis, light-headedness, nasopharyngeal lesion, throat irritation, and weakness and fatigue.^[6]

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Although fume extraction technologies exist and are readily available, they are still not routinely used. A review

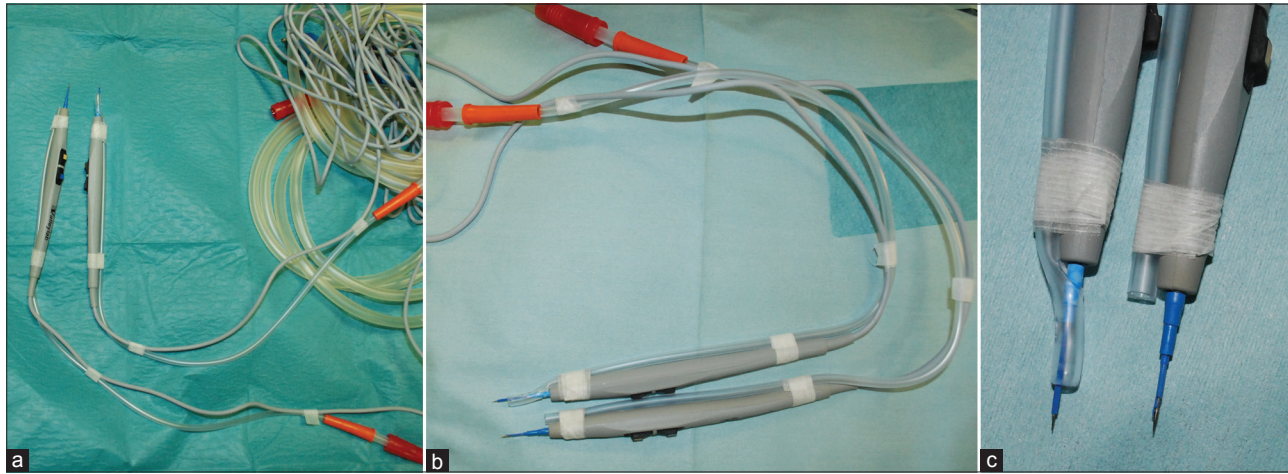


Figure 1: (a, b) A small cannula, connected to the extractor, attached to the electrosurgical scalpel, closely adjacent to the scalpel; (c) close-up image of the proposed device

published in 2008 reported that fewer than 50% of interviewees adopted a fume extractor system, especially when the fumes were generated by electrosurgical scalpels.^[7] Extractor systems are straightforward to use, however, and can be handled by any member of the operating room team.

Many surgical team members, irrespective of their role, have difficulty recognising the hazards of inhaling surgical fumes. Failure to remove them, associated with the apparent disinterest in the negative effects of their inhalation, raises the risk of occupational diseases and creates a polluted environment for the operating room staff.^[6] Moreover, frequently open suction devices have unsatisfactory flue gas purification because of the lack of fine filters, and this causes the release of waste gas with its components back into the operating room.^[5]

We have developed and adopted a simple method to improve the safety of the operating room, consisting of a small cannula, connected to an extractor, attached to the electrosurgical scalpel so that its end is closely adjacent to the scalpel Figures 1a, b.

This enables fumes to be aspirated as soon as they are generated. It has been shown that smoke evacuators are 98.6% effective when placed 1 cm from the treatment site, with efficacy decreasing to 50% when moved to 2 cm from the treatment site.^[8]

Using this method also ensures that an adequate operating room environment is maintained without the need for any additional operators, and without having

to distract any member of the surgical team from their activities [Figure 1c].

Surgical smoke is evacuated outside the operating theatre through an open system: Exhausts are filtered and then eliminated outside the building: No smoke recirculation ever happens.

By adopting this simple solution, we believe that the inhalatory risk to operators involved in surgical procedures can be reduced.

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