consisting of hemorrhage, hemosiderin deposition, mild chronic inflammatory cell infiltration, dense fibrosis, and nuclear pleomorphism. This ancient schwannoma is benign but must be differentiated from neurofibrosarcoma and malignant schwannoma. On the other hand, in a long-term follow-up of more than 2000 patients who had undergone irradiation for tonsil and adenoid enlargement, Shore-Freedman et al.[8] found 29 schwannomas. Therefore, these tumors can be radiation induced.

On presentation, schwannomas are almost always slow-growing, painless masses. The diagnosis is confirmed by microscopic examination. Because these tumors may still be somewhat similar to neurofibromas and other connective tissue masses, immunohistochemical staining may be used as an additional diagnostic tool. For this purpose, a neural crest marker antigen known as S100 protein may be used to help distinguish peripheral nerve sheath tumors from connective tissue masses.[9]

The differential diagnosis of possible malignant tumors (on the basis of data relating to speed of growth and clinical appearance of the neoplasm) and benign epithelial and connective tissue neoformations includes fibrosarcoma, malignant fibrous histiocytoma, leiomyoma, lipoma, neuroma, and adenoma.[10,11]

Most cases present in the 25- to 55-year age group. Our patient was 7 years old. Tumors of the sympathetic chain make up 7.4 percent of tumors arising in children. De Campora et al.[12] observed 26 cases of head and neck schwannoma in pediatric patients (age range, 8 to 16 years) over a period of 19 years.

These tumors grow longitudinally along the length of the nerve, assuming a fusiform appearance but without compromising the morphological or functional integrity of the nerve. They can therefore be separated surgically from their nerve of origin.[13] However, only 50 percent of these tumors have a direct relationship with a nerve.[14] Complete excision is curative for schwannomas, as with other benign tongue masses.
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SURGICAL SMOKE WITHOUT FIRE: THE RISKS TO THE PLASTIC SURGEON

Sir:

Plastic surgeons encounter surgical smoke routinely as a by-product either of electrocautery, laser ablation, or ultrasonic (harmonic) scalpel tissue dissection. Strictly speaking, "smoke" is composed of the products of combustion, while "plume" is a mix of combusted and noncombusted particles, the mix and size of which can vary with the device used. The hazards of smoke plume inhalation are real, proven both scientifically and clinically. They range from the production of chemicals estimated to be as harmful as cigarette smoking to the transmission of biological pathogens carried on the particles released. We describe a simple, cheap, and effective method of removing this surgical smoke plume from the operative field and discuss the advantages of such a system.

A standard piece of silicone suction tubing with an internal diameter of 7 mm was secured to a handheld probe using the string ties normally found binding a set of five "small" sterile gauzes. In this case, the probe was from an ERBE APC 300 laser unit, as shown in Figure 1. The open end of the suction tube was distanced 5 cm from the laser tip with a suction pressure of 30 kPa applied; this provided uptake of virtually all smoke plume in the operative field. No adverse effect on the cutting or coagulation performance of the equipment at any preset program was noted during surgery.

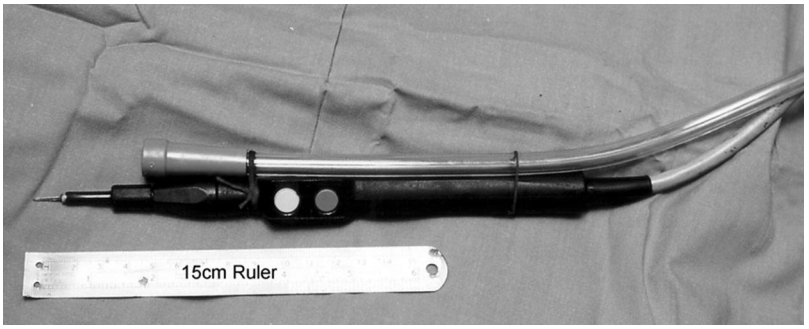

FIG. 1. A standard piece of silicone suction tubing with an internal diameter of 7 mm is secured to a handheld probe (from an ERBE APC 300 laser unit) using string ties. The open end of the tube is 5 cm from the laser tip and has a suction pressure of 30 kPa, to provide uptake of virtually all smoke plume in the operative field.

The risks of smoke plume exposure generated by these electrosurgery devices have been investigated since the 1980s.[1] The device used and the target tissue acted upon determine the particle size and mix. Electrocautery creates particles with the smallest mean size of 0.07 μm, laser tissue ablation generates larger particles, with a mean size 0.31 μm, and the largest particles generated are from the ultrasonic (harmonic) scalpel, at 0.35 to 6.5 μm.[2–4] The smaller the particles, the further they travel. Smaller particles are more chemically based, but as the particulate matter increases in size, it poses more of a biological hazard, acting as a vector for pathogen transmission, with larger particles traveling up to 1 meter from the operative field.[4]

Electrocautery. More than 40 different chemicals have been identified in the smoke generated by electrocautery devices. Hydrocarbons, nitrates, fatty acids, and phenols are present in the greatest quantities, but of concern are the large amounts of acrylnitrile and carbon monoxide produced.[5] Acrylnitrile can be not only inhaled but also absorbed through the skin, exerting its toxicity by liberating cyanide.[6] Exposure levels of operating room staff have been estimated to be 1.0 to 1.6 parts per million; the current Occupational Safety and Health Administration has set an upper limit of exposure at 2.0 parts per million.[7]

Carbon monoxide levels may reach up to 10 parts per million in the operating environment, with 11 parts per million being the recommended limit of average exposure during an 8-hour period by the Canadian Federal-Provincial Advisory Committee on Environmental and Occupational Health.[8] Interestingly, intraperitoneal levels of carbon monoxide may be as high as 1900 parts per million during a laparoscopic cholecystectomy. Carbon monoxide can potentially pass through to the patient's bloodstream and cause systemic effects.

Furthermore, electrocautery smoke, with its release of benzene, formaldehyde, and hydrogen cyanide, although in relatively small quantities, has been estimated to be as mutagenic as cigarette smoke.[9,10]

Laser. The laser plume is potentially more hazardous than electrocautery smoke. Along with the numerous chemicals generated, the particulate matter has the potential to transfer pathogens. In addition to viruses, in vitro experiments have managed to culture bacteria from laser plume.[11,12] Concern about the transmission of pathogens led to a study that identified human immunodeficiency virus DNA in laser smoke plume, demonstrating its transmission to cultured cells. This infection lasted 14 days but was not present at 28 days, which suggests that the DNA had been altered in a way that prevented its propagation after infection.[13] However, there have been case reports of human papillomavirus DNA being isolated from warts developing on unusual sites such as the face, nasopharynx, and larynx of laser operators who often remove plantar and anal warts.[14,15]

Ultrasonic (harmonic) scalpel. Large quantities of cellular debris ($>1 \times 10^7$ particles/ml) are found in the plume generated by an ultrasonic scalpel. Fatty tissue has been found to generate 17 to 23 times more particulate matter than lean tissue.[4]

The ultrasonic scalpel is said to produce a vapor, not smoke, with the process being described as low-temperature vaporization. This is concerning because cool aerosols in general have a higher chance of carrying viable infectious material than higher-temperature aerosols. There is conflicting evidence about the composition of the aerosol between those who believe the particles are composed of living tissue and those who describe very few morphologically intact cells with little or no viability.[16]

The potential dangers of surgical smoke plume have been investigated for more than 20 years. Despite published studies demonstrating the mutagenic and thus potentially carcinogenic risk, as well as the infectious risks, the overall long-term outcome of exposure to surgical smoke plume is still not really known.

Reducing the exposure of surgeons and operating room staff is the most sensible solution. Unfortunately, the surgical mask is not effective in filtering smoke particles, but it can significantly reduce the amount of particulate matter inhaled. Of course, this will be compromised by a poorly fitting mask, and filtering varies among mask manufacturers.[17] Commercial smoke evacuation systems installed in operating rooms are available, but these are relatively expensive, and we believe that removing the majority of smoke plume from its source (i.e., the operative field) is a more sensible approach.[18] Handheld smoke evacuation devices have been described in the past, but as far as we are aware this is the first time such a device has been described for use with the laser with no adverse outcomes.[19] We hope that more surgeons who routinely encounter the surgical smoke plume will adopt this simple, cost-effective evacuation method, bearing in mind the unknown, long-term potential risks of exposure.

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A NOVEL MODEL FOR SKIN GRAFT HARVESTING

Sir:

The acquisition of technical skills is becoming more difficult with ever-decreasing working hours and less operating time. In the United Kingdom, the drive to treat more patients (to reduce waiting lists) without compromising patient care means that trainees must achieve some competence before operating on patients. This has led to the development of artificial simulators to allow trainees to gain confidence before moving on to patients.[1]

Harvesting of a split-thickness skin graft is a common plastic surgery procedure with a potentially high morbidity rate; it lends itself well to simulated teaching.[2] We present a model developed in our unit to train basic surgical trainees at the start of their rotation in the art of skin grafting.

Previously reported models have replaced synthetic materials with porcine skin, an excellent human skin substitute,[3] and even with partially cooked lasagna.[4] However, little consideration has been given to the anatomical correctness or "feel" of the simulation. We aimed to construct a simulator mimicking a human thigh donor site in its consistency, shape, and size, to provide a more realistic operating room experience (Fig. 1).

Under the supervision of senior surgeons, two junior trainees are assigned to a simulator. The assistant holds the outer layer taut (Fig. 2) to allow the surgeon to become familiar with harvesting split-thickness skin grafts with manual or power-assisted dermatomes under different conditions: knife/skin angle, tautness of skin, and pressure on skin. Figure 3 shows the different graft thicknesses obtained using the simulator. This model has been used successfully in surgical workshops, where it is also used to teach full-thickness skin grafting, subcuticular closure, and graft fixation using tie-over sutures.

We believe this versatile model allows a more realistic experience in the harvesting of split- and full-thickness skin grafts, where the surgical trainee acquires technical skills similar to those learned in the in vivo experience. Once satisfactory technique, competence, and confidence have been acquired, the surgeon may progress to patients.

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