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respirator for health care workers participating in aerosol-generating procedures. Thus, it is essential that all providers and staff who are participating in procedures located on mucosal regions be provided with an N95, especially if aerosols are generated with electrocautery.⁴ To take further precaution, we also suggest that patients having procedures performed in mucosal regions be tested for COVID-19 before their visit. It is our hope that this letter raises awareness of the potential harmful effects of surgical smoke to spur further insights and action regarding preventative measures for resuming outpatient dermatologic procedures in the age of COVID-19.

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N95 Respirators for Dermatologic Surgery and Laser Procedures During COVID-19 and Beyond

The SARS-CoV-2 (COVID-19) pandemic brought personal protective equipment (PPE) to the forefront of medicine. Although surgical masks are consistently used in dermatologic surgery, N95 filtering facepiece respirators (FFRs) have not been widely used. Some recommendations exist, but no official guidelines discuss facial protection with N95 respirators for Mohs micrographic surgery (MMS) or other dermatologic surgery including ablative lasers. Because of the current pandemic, close proximity of many of these procedures to the orofacial region and the increased risk for exposure to chemical irritants generated as a result of electrocoagulation or laser ablation, it is imperative that physicians and surgeons understand current evidence and knowledge gaps.

Dermatologic surgery has inherent risks, including needle sticks, smoke inhalation, splash injury, and viral transmission. Electrocoagulation and laser ablation generate a surgical plume, which poses a significant risk as a respiratory tract irritant, mutagen, and vector for infectious particles.¹ Chemicals generated from surgical plume, such as nitriles and hydrogen cyanide, have been shown to have carcinogenic and mutagenic effects in vitro indicating the need for adequate protection during these

dermatologic surgery.¹ Surgical plume also acts as a vector for viral transmission, with dense laser ablative smoke containing higher viral DNA content than electrocoagulation smoke.¹ Human papillomavirus (HPV) and HIV are transmissible in surgical plume, and the use of high efficiency air respirators alongside a smoke evacuator 1 inch away from any dermatologic surgery generating adequate smoke plume is recommended.¹ Smoke evacuators capture and filter surgical plume during electrosurgical or laser procedures, minimizing exposure of the health care professionals and patients to harmful contaminants.¹

Surgical masks offer protection against particulate matter size greater than 5 μm , with a filtration efficiency of 91.53%.¹ However, most surgical smoke contains particulate matter less than 5 μm and thus requires increased filtration capacity.¹ Biologic material in smoke can range in size, with the COVID-19 virus reported to be 0.06–0.14 μm , comparable with the size of influenza virus, whereas HIV and HPV are 0.12 and 0.055 μm , respectively.² N95 FFRs offer more effective protection from harmful particles generated from surgical smoke and infectious particles as they can filter submicrometer-sized particles and are designed to allow no more than

5% penetration.³ The previous literature has established improved protection from surgical smoke with N95 FFRs compared with standard surgical masks.³ These data were quantified as simulated workplace protection factor (SWPF) by comparing the aerosol concentrations and particle distribution inside and outside the mask. Results outlined essentially no protection from surgical smoke while wearing a surgical mask and a statistically significant improvement in SWPF when wearing N95 FFRs compared with the surgical mask.³ Therefore, a properly fitted N95 FFR offers superior protection from residual plume generated from electrosurgical or laser procedures in the absence of smoke evacuator use. In addition, N95 respirators have demonstrated superiority over surgical masks in protection from viral transmission. A recent systematic review with meta-analysis also found that face mask use could result in a large reduction in risk of COVID-19 infection (aOR 0.15, 95% confidence interval 0.07–0.34), and increased benefit with N95 respirators was seen when compared with surgical masks ($p_{\text{interaction}} = 0.090$; posterior probability >95%).⁴

Most current national and international guidelines include the use of an N95 respirator for all aerosol-generating procedures involving patients with COVID-19, although inconsistencies exist. COVID-19 can be spread by talking or exhaling, but risk of transmission while wearing a surgical mask is under debate. The American College of Surgeons groups electrocoagulation of blood with other aerosol generating procedures and requires the use of full PPE, including an N95 or a similar respirator, when performing such procedures. The American Academy of Otolaryngology recommends limiting nonessential surgeries and the mandatory use of N95 FFRs for all procedures that cause aerosolization. Similar recommendations have been made by the American Dental Association. Recommendations for dermatologic surgery and laser procedures during this pandemic include the usage of well-fitted N95 FFRs for all procedures in close proximity to the periorificial region.⁵ Minimum required PPE for providers and staff involved with an aerosol generating procedure should include an N95 or equivalent mask, wraparound safety glasses or full goggles, gloves and a gown, and if available a surgical cap.⁵ Additional precautions for energy-based procedures include a smoke evacuator system.⁵ Personal protective equipment con-

siderations are vital for the safety of physicians and staff. The use of N95 respirators should be strongly considered during MMS, particularly when working for extended periods in the periorificial area, as well as any dermatologic procedure which produces a surgical plume including laser ablation and electrocoagulation when blood is present, even after the pandemic. It is important to undergo respirator fit testing to ensure adequate fit of the respirator and that safe donning and doffing be practiced to minimize contamination of the respirator and fingers. Other system safety measures include smoke evacuation and adequate environmental sanitization protocols. These recommendations are irrespective of PPE availability and focus solely on the medical risk from smoke inhalation and viral transmission.

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