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Coronavirus disease 2019 (COVID-19): challenges and management of aerosol-generating procedures in dentistry

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Coronavirus disease 2019 (COVID-19): challenges and management of aerosol-generating procedures in dentistry

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A commentary on

David A P, Jiam N T, Reither J M, Gurrola J G, Aghi M, El-Sayed I H. Endoscopic Skull Base and Transoral Surgery During the COVID-19 Pandemic: Minimizing Droplet Spread with a Negative-Pressure Otolaryngology Viral Isolation Drape (NOVID). *Head Neck* 2020; 10.1002/hed.26239

Abstract

Data sources Experimental investigation.

Study design A retrospective review to evaluate the use of a negative-pressure otolaryngology viral isolation drape (NOVID) system to reduce cross-infection through aerosol. The apparatus consists of a plastic drape suspended over the surgical field in the head and neck region with a smoke evacuator suction placed inside the chamber with an ultra-low penetrating air (ULPA) efficiency rating and a fluid suction high-efficiency particulate air (HEPA) filter compartment. Spread of patient secretions and droplet formation was evaluated using 1% fluorescein dye in 10 ml of normal saline and ultraviolet light. The dye was applied topically in the nasal cavity and nasopharynx preoperatively and intraoperatively prior to the use of instruments such as micro-debrider, electrocautery and high-speed drilling. Following completion of the surgical procedure, an ultraviolet Wood's lamp was used to evaluate the presence of droplets on the surgical drapes and surgical gowns of the operating team.

Results The study sample consisted of four patients who underwent endonasal endoscopic surgical procedures; two of these patients required concurrent endoscopic sinus surgery. A micro-debrider was used in three cases; electrocautery in three cases, while a high-speed drilling was employed in two cases. Presence of fluorescein was identified around the patients' nares; on the chest wipe and instrument tray in all four patients. Dye contamination was noted on the gauze placed over the smoke evacuator (two cases of skull base surgery); no fluid droplets were identified beyond the nares or the smoke evacuator (two cases of sinus surgery). However, fluid contamination was identified underneath barrier several centimetres away from the nares (one case of trans-sphenoidal surgery). Droplets were also identified on the surgeon's gown in the abdominal region in all cases and on the arm region in one case. In one case, droplets were also identified on the abdominal region of the nurse, but this was attributed to cross contamination from surgical gauze and instruments.

Conclusions This retrospective study provides preliminary data on aerosol and droplet contamination during endonasal and transoral surgery performed under a negative pressure isolation drape system. Although the authors did not screen patients for SARS-CoV-2, they propose smoke evacuator ULPA filter attachment is appropriate to capture particles down to 0.1 microns including SARS-CoV-2 which is 0.125 microns. It would be helpful to see direct evidence to support this claim in future studies. The authors have not provided details regarding set-up time and training requirements for effective application of the isolation drape apparatus or the associated costs etc. It would have also been helpful if the authors could comment on any potential difficulties in undertaking the surgical procedure with the isolation system in place. The sample size is limited to four patients and variations in the magnitude and extent of aerosol contamination needs to be investigated further before drawing any conclusions. Although unlikely, this study design did not capture the presence of aerosol/droplets in the air within the operating room which may follow removal of the isolation drape system or from exposed surgical instruments. Notwithstanding the limitations of the design, negative-pressure aspiration of air under a chamber barrier is likely to minimise the contamination from aerosol and droplet during endonasal and transoral surgery.

GRADE rating ●●○○

Practice points

- For now practitioners should focus on emergency and preventive dental care as evidence-based clinical protocols are needed prior to commencing invasive dental procedures
- Dental surgeries represent a potentially high-risk clinical environment and dental professionals must follow the most updated national and international guidelines in letter and spirit to protect themselves as well as their staff, patients, and the general public from further spread of COVID-19
- Additional costs related to PPE, staff training, and the investment to improve clinical environment coupled with low rates of patient turn-over will have a knock-on effect on the financial resources of dental businesses. Therefore, governments and healthcare bodies must be urged to come up with concrete strategies to support the dental profession and keep dental practices financially viable
- Finally, dental professionals should not remain at the receiving end of cross infection control guidelines and should explore appropriate platforms to actively participate in research aimed at informing evidence-based protocols to limit the spread of COVID-19 in dental environments.

Commentary

The coronavirus disease (COVID-19) caused by the novel coronavirus (SARS-CoV-2) has had an unprecedented impact on people across the globe. Even the most advanced healthcare systems in the world are still battling to deal with the challenges of COVID-19 and no single strategy to limit the spread of this pandemic appears to be sustainable. COVID-19 has posed serious tests for the political leadership across the globe due to the financial and social fallout and also exposed the vulnerabilities of modern healthcare infrastructures. The death rate from COVID-19 in the Western world including the USA, UK, France, Italy, and Spain etc, has been alarming[1] and has raised questions regarding our preparedness for managing pandemics.

Unsurprisingly, COVID-19 is the prime focus of rapid medical research since the beginning of the current year and tremendous progress is being made as we try to unravel various facets of this pandemic. COVID-19 has taken medical scientists by surprise and the urgency to produce scientific evidence has outpaced existing expertise and systems. Besides social distancing measures and vaccine development, medical research is currently exploring the use of existing drugs to manage COVID-19. Amongst several medicines with the potential to hasten recovery from COVID-19[2] Remdesivir has shown some positive results. However, like with many other drugs, further adequately powered trials and meta analyses are required before it can be recommended for widespread use in clinical practice.[3]

The eventual goal in the fight against COVID-19 is the development of a vaccine and a large number of human trials have already been rolled out. COVID-19 is an RNA virus and like flu viruses, it is more prone to changes and mutations compared to DNA viruses. Recent research highlights the diversity of SARS-CoV-2 strains and co-circulation of different clades in different countries. Different genetic lineages within different clades have been observed.[4] Further research is required to understand if reinfections after recovery are possible, and how potential mutations could affect the vaccines under development? Uncertainties also exist regarding the degree and nature of the immunity required for protection from COVID-19 and whether exposure to COVID-19 can confer herd immunity?[5]

The novel coronavirus (SARS-CoV-2) has been found in nasopharyngeal secretions as well as saliva. Spread of infection is mainly through respiratory droplets and direct contact with infected individuals and inanimate objects.[6] Critically, SARS-CoV-2 can spread through aerosols generated during dental procedures and can not only spread for considerable distances but also may remain suspended in the air for several hours rendering the dental surgery environment as a high risk area for nosocomial spread.[7]

Current recommendations on providing dental care are largely based on expert opinion and a combination of direct and indirect evidence. Until the development and delivery of an effective COVID-19 vaccine, dental care for patients is limited to emergency treatment in most developed countries. At present, it is advisable to triage patients using remote consultations. Face-to-face consultation may be provided to a select group of patients after appropriate risk assessment. Appropriate physical and temporal separation measures should be implemented during face-to-face consultations and adequate time should be reserved for set-up, clearance, and decontamination of the surgery between patients.[8] Global protocols for clinical dentistry during COVID-19 show some geographic variations but there is a broad-based consensus on observing excellent hand hygiene and the use of appropriate personal protective equipment (PPE). The recommended PPE includes fluid-resistant gowns; gloves; filtering face piece respirator (FFP3) or N95 masks; and appropriate eye protection.[9] Additional measures which have been suggested during operative procedures include effective use of high-volume suction devices; rubber dam isolation; adjunct chemotherapeutic agents mouth rinse with 0.2% povidone-iodine or 0.5–1% hydrogen peroxide may also be utilised preoperatively to reduce the viral load in the oral cavity.[10,11]

The use of NOVID system offers promise to limit contamination from aerosol during surgical procedures performed under general anaesthesia in operating theatre environments. Although use of this device on conscious patients in dental practice settings is unlikely in its current form, it opens doors to innovation in the development of barrier systems. In any case, dentists may benefit from evaluating the spread on aerosol during operative dentistry by using fluorescein dye and ultraviolet (UV) light as identified in this study.

Given our current understanding, COVID-19 may be around for the coming months or even years, and is likely to influence the provision of dental care in more ways than one. The best-case scenario is development of an effective vaccine and coupled with universal precautions, life in dentistry may return to normal. Until then, we are likely to be presented with a plethora of strategies and measures aimed at minimising the spread of COVID-19 in clinical dental settings. These may include innovations in PPE; barrier devices to minimise aerosol contamination; air purification systems; anti-viral adjuncts; chairside screening for COVID-19 in saliva; and modifications in clinical techniques, to name a few. Undoubtedly, commercial players in the dental market will be interested to exploit these business opportunities as dentistry attempts to resume. Therefore, dental professionals must make informed choices supported by scientific evidence. On the plus side, COVID-19 presents an opportunity for dental professionals to diversify their career interests and explore their research potential through engagement with relevant research forums and platforms. Cross infection protocols in dentistry are likely to undergo rapid evolution and dental professionals must contribute to this process rather than wait to be told what to do!

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