Otolaryngology: Open Access
ISSN: 2161-119X

Review Article Open Access

Aerosol-Generating Otolaryngology Procedures and the Need for Enhanced Ppe during the Covid- 19 Epidemic

Russell Murphy*

Department of Surgery, University of Saskatchewan, Wall Street ENT Clinic, 230-140 Wall Street, Saskatoon, SK S7K 1N4 Canada.

Abstract

Acceptable particular defensive outfit is demanded to reduce the rate of transmission of COVID- 19 to health care workers. Otolaryngology groups are recommending an advanced position of particular defensive outfit for aerosol- generating procedures than public health agencies. The ideal of the review was to give substantiation that) Demonstrates which otolaryngology procedures are aerosol- generating, and that) Clarifies whether the advanced position of PPE supported by otolaryngology groups is justified [1].

Health care workers in China who performed tracheotomy during the SARS- CoV- 1 epidemic had 4.15 times lesser odds of contracting the contagion than controls that didn't perform tracheotomy (95 CI2.75-7.54). No other studies give direct epidemiological substantiation of increased aerosolized transmission of contagions during otolaryngology procedures. Experimental substantiation has shown that electro cautery, advanced energy bias, open suctioning, and drilling can produce aerosolized natural patches. The viral cargo of COVID- 19 is loftiest in the upper aero digestive tract, adding the liability that aerosols generated during procedures of the upper aero digestive tract of infected cases would carry viral material. Cough and normal breathing produce aerosols which may increase the threat of transmission during inpatient procedures [2,3]. A significant proportion of individualities infected with COVID- 19 may not have symptoms, raising the liability of transmission of the complaint to deficiently defended health care workers from cases that don't have probable or verified infection. Powered air purifying respirators, if used duly, give a lesser position of filtration than N95 masks and therefore may reduce the threat of transmission.

Introduction

During the coronavirus complaint 2019 (COVID- 19) epidemic, particular defensive outfit (PPE) worn by health care workers is critical for reducing transmission of the infection in health care settings, particularly when aerosol- generating medical procedures (AGMP) are being performed. An aerosol is suspense of fine solid patches or liquid driblets in air or another gas. Within an aerosol, viral drop capitals can travel long distances and remain in the air for long ages of time. Aerosols aren't as effectively filtered by surgical masks, and can be breathed directly into the lungs. For transmission to do it isn't enough for viral material to live in drop capitals; the contagion must remain feasible. Whether or not COVID- 19 remains feasible in aerosols (and for how long) is still being delved , but the balance of substantiation indicates that betacoronaviradae similar as the 2003 SARS coronavirus (SARS- CoV- 1) are feasible in aerosols. Numerous otolaryngology procedures are allowed [4, 5].

To be aerosol- generating. When healthcare workers are at threat of transmission of infection from aerosols, "airborne" (rather than drop) preventives are needed.

Otolaryngologists who are susceptible to being infected with COVID- 19 and who are working in close propinquity to infected apkins for lengthy ages may be exposed to large contagious boluses. COVID- 19 infects the upper aero digestive tract with the loftiest viral loads being in the nasal depressions. The surgeon's nose, throat, and conjunctiva (all implicit routes of transmission) are generally within 30- 60 cm of the case's upper respiratory mucosa. During AGMP, as a surgeon gets near to the source of the aerosol, flyspeck viscosity increases exponentially according to principles of prolixity [6].

The association between contagious cure and complaint inflexibility has not yet been determined. Similar new viral respiratory contagions, still, may give a degree of substantiation. The introductory reproductive figures (the anticipated number of cases directly generated by one existent in a population where all individualities are susceptible) for SARS- CoV- 1 and COVID- 19 appear to be analogous and therefore comparisons are reasonable. In beast studies, adding the original exposure to SARS- CoV- 1 increased the threat that mice developed the infection. Greater original exposures to SARS- CoV- 1, MERS coronavirus and influenza redounded in more severe complaint. In at least one recent study, an advanced attention of COVID- 19 in the nasal passages was associated with increased threat of more severe complaint and death. Viral cargo, still, is measured after the onset of infection and therefore isn't a deputy for pestilent cure.

During the epidemic, health care agencies similar as the World Health Organization, U.S. Centers for Disease Control and the Public Health Agency of Canada are responsible for defining AGMP and rationing PPE when demand is lesser than force. The lists of AGMP frequently don't specifically include otolaryngology procedures. National otolaryngology associations and other ENT groups have published otolaryngology-specific AGMP lists and PPE guidelines that call for lesser situations of protection than the public health agencies [7-9]. The Canadian Society of Otolaryngology- Head and Neck Surgery call for airborne preventives when performing AGMP on cases for whom the indicator of dubitation.

For COVID- 19 infection isn't high, whereas the World Health

***Corresponding author:** Jeffrey M. Straub, Department of Otolaryngology-Head and Neck Surgery, The Ohio State University, 915 Olentangy River Road, Suite 4000, Columbus, OH 43212, E-mail: edenshegaw@gmail.com

Received: 02-June-2022, Manuscript No. ocr-22-66031; **Editor assigned:** 04-June-2022, Pre QC No. ocr-22-66031 (PQ); **Reviewed:** 20-June-2022, QC No. ocr-22-66031; **Revised:** 25-June-2022, Manuscript No. ocr-22-66031 (R); **Published:** 30-June-2022, **DOI:** 10.4172/2161-119X.1000468

Citation: Murphy R (2022) Aerosol-Generating Otolaryngology Procedures and the Need for Enhanced Ppe during the Covid- 19 Epidemic. Otolaryngol (Sunnyvale) 12: 468.

Organization, the U.S. Centers for Disease Control, and the Public Health Agency of Canada do not. Also suggest that health care workers use powered air purifying respirators (PAPRs) when available for AGMP performed on cases with probable or verified COVID- 19, in discrepancy to public health agencies that are moreover silent on the issue or suggest PAPRs aren't demanded [10].

Most ENT outpatient procedures induce coughing due to deep instrumentation and/or excessive mucous or blood that triggers the cough reflex. The jet of droplets and aerosols expelled by a cough can hit nearby health care workers at high volume and velocity, and at close range. The frequency of cough is higher in a patient infected with COVID-19, since it is a symptom of the infection. The World Health Organization considers cough to be aerosol-generating, a position that is supported by a number of studies. The average distribution of droplet sizes expelled during cough ranges on average between 0.58-5.42 µm, with multi-modal peaks at 1, 2 and 8 µm. Larger droplets may partially evaporate during the jet expulsion from the mouth to produce smaller droplet nuclei. Aerosols are also generated by "pursed lip" breathing methods, often adopted by patients who have epistaxis to avoid aspirating blood trickling posteriorly and into the throat [11, 12].

Aerosols can be produced by normal breathing as air passes over respiratory mucosa, through the reopening of closed small airways to form small airborne droplets, and/or through fluid film rupture in the bronchioles. During normal breathing, the lungs filter out larger droplets from being exhaled. As might be expected, coughing produces more aerosolized droplets than normal breathing or talking. Breathing rate and age are both positively correlated with breath aerosol concentration, but do not completely explain the variability observed between individuals [13].

Evidence clarifying if enhanced PPE are needed for otolaryngology AGMP

Give et al. and the Canadian Society of Otolaryngology-Head and Neck Surgery suggest adhering to airborne precautions when performing AGMP on patients whose COVID-19 status is unknown or who have low risk of infection during the pandemic. They also recommend PAPRs (if available) to perform AGMP on patients with probable or confirmed COVID-19. The World Health Organization, CDC and Public Health Agency of Canada do not make these recommendations [14].

Occupational health professionals are often tasked with determining the type of PPE needed in novel circumstances arising in various industries. The CDC through the National Institute for Occupational Safety and Health (NIOSH) and the Canadian Center for Occupational Safety and Health recommend "control banding" as a qualitative or semi-qualitative technique used to guide the implementation of workplace control measures. In control banding assessments, the potential for harm is determined by 1) The consequences of exposure; 2) The concentration of toxin; and 3) The risk of exposure. Operations that expose workers to a greater potential for harm demand more stringent control measures. The consequences of COVID-19 infection to individuals are well described elsewhere but range from mild illness to death. If health care workers become sick they can pass the infection to others, propagating the pandemic, and are no longer available to assist on the front lines. The increased risk of exposure to high concentrations of aerosols during otolaryngology AGMP has already been discussed. Thus, the following section focuses on the third element, the risk of exposure to COVID-19, and the likelihood that the different PPE recommended by the different groups alters the risk [15,16].

Is COVID-19 transmitted via aerosols?

Respiratory aerosols typically consist of droplet nuclei less than 5 µm in size. Droplets fall to the ground at rates inversely proportional to their size. A 10 µm diameter particle settles in 8.2 min, compared to 1.5 h for a 3 µm diameter particle, and 12 h for a 1 µm particle. Thus, unless rooms are well ventilated, aerosolized droplets can become more concentrated over time. For an infection to be transmitted via aerosol, the organism must be able to survive within the droplet nuclei until it is deposited onto the mucous membrane of a susceptible individual either via inhalation or direct contact.

The World Health Organization has cautioned that more studies are needed to confirm if COVID-19 is transmitted via aerosols, however an April 1, 2020 report from the U.S. National Academies of Science, Engineering and Medicine suggests it is likely. The letter cites studies in which COVID-19 RNA was detected in air samples in hospital rooms of patients with COVID-19. A widely cited experimental study indicates that COVID-19 can remain viable in aerosols for hours, but has been criticized since the methods used to aerosol the virus in the experiment are not reflective of AGMP or natural cough. A case report of a trans-nasal pituitary adenoma excision performed in China before widespread introduction of strict PPE provides anecdotal evidence of aerosolized transmission of COVID-19. During the case, fourteen Chinese health care workers were reportedly infected by the patient (who was mildly symptomatic pre-operatively), who was later confirmed to have COVID-19. Transmission occurred to workers who were both inside and outside the operating room. During the SARS-CoV-1 epidemic, the largest nosocomial outbreak in Hong Kong occurred with a clear spatial pattern of infection that matched ventilator patterns of the hospital floor, suggesting aerosolized transmission was likely. A similar study showed that the pattern of spread of a large community outbreak of SARS-CoV-1 matched the ventilator pathways from the apartment of the index case [17].

During the SARS-CoV-1 epidemic, it was initially thought that transmission occurred primarily via contact or large respiratory droplets. It was observed, however, that transmission to health care workers occurred despite the use of contact and droplet precautions, particularly during procedures suspected to be aerosol-generating such as endotracheal intubation. A meta-analysis of observational studies evaluating the risk of transmission of SARS-CoV-1 during the epidemic showed that health care workers performing endotracheal intubation, non-invasive ventilation, tracheotomy and manual ventilation before intubation were significantly more likely than health care workers not involved in these procedures to contract the disease. Only one case-control study of front-line health care workers caring for SARS-CoV-1 patients in China contributed to the "meta-analysis" of tracheotomy. In the univariate analysis, 6/85 cases (who had IgG against SARS-CoV-1) versus 11/646 controls (who did not have IgG against SARS-CoV-1) had performed tracheotomies during the epidemic (Odds ratio 4.15, 95% CI 2.75, 7.54) [18].

The odds ratio for bronchoscopy, on the other hand, did not reach significance (pooled OR 1.3, 95% CI 0.5, 14.2). Many public health agencies and professional organizations, however, list bronchoscopy as an aerosol generating procedure. The World Health Organization appears to classify bronchoscopy as an AGMP based on a study comparing the rate of tuberculin skin test conversion among pulmonology and infectious diseases fellows graduating in 1983 during a resurgence of tuberculosis in the United States. Seven of 62 (11%) pulmonology fellows versus one of 42 (2.4%) infectious diseases fellows reported having converted tuberculin skin tests during their fellowships. It was not clear that the pulmonology fellows were infected as a result of performing bronchoscopies. A 2009

study during the H1N1 influenza outbreak measured the amount of viral RNA in the air in the vicinity of H1N1 positive patients undergoing bronchoscopy and other procedures, compared to controls. The concentration of viral RNA was not significantly increased during bronchoscopy or any other procedure studied. The authors wrote that their study may have been underpowered to detect small differences in aerosol concentrations [19].

If bronchoscopy is aerosol-generating, it may be due to the suctioning usually involved with the procedure. Air currents moving across the surface of a film of liquid generate droplets at the air-liquid interface, with the size of the droplets inversely proportional to the velocity of the air. It is for this reason that any procedure that involve open suctioning of the airway is usually classified as aerosol-generating.

The reuse of disposable N95 masks

Given the shortages of disposable N95 filtering face piece respirators worldwide, there has been emphasis on their reuse. For example, Give et al state that it may be appropriate to reuse N95 masks after AGMPs performed on patients at low risk of having COVID-19. Experimental models show that virus survival on N95 masks depends on time elapsed and relative humidity. SARS-CoV-1 can survive for up to 28 days on medical equipment in low temperature and low humidity environments. There has been no published research on experiments involving COVID-19. A variety of decontamination methods have been proposed, from using heat and steam, hydrogen peroxide vapor, UV light, and letting the mask sit for days before repeat usage. The use of ultraviolet light (UV-C) has been proposed owing to its ability to penetrate the materials found in N95 masks. Using a surrogate virus, Fisher and Shaffer described that a minimum dose of 1000 j m-2 of UV-C is required to cause a 3 log reduction in a surrogate virus. Vaporized hydrogen peroxide has also been suggested as method useful for decontaminating materials, and has been demonstrated to reduce infectious titers of mammalian viruses to less than ten 50% tissue culture infective doses (TCID50). The CDC has provided statement that decontamination with UVC, vaporized hydrogen peroxide, or moist heat could be considered by health care institutions in an emergency [20].

Conclusion

Direct and circular substantiation suggests that a large number of otolaryngology- head and neck surgery procedures are aerosol generating. Otolaryngologists are likely at high threat of constricting COVID- 19 during aerosol generating procedures because they're likely exposed to high viral loads in cases infected with the contagion. Grounded on the preventative principle, indeed though the substantiation isn't definitive, espousing enhanced particular defensive outfit protocols is reasonable grounded on the substantiation? Farther exploration is demanded to clarify the threat associated with performing colorful procedures during the COVID- 19 epidemics, and the degree to which colorful particular defensive outfit reduces the threat.

Acknowledgement

None

Conflict of Interest

None

References

1. Lindsley W, Blachere F, Thewlis R, Vishnu A, Davis K, et al. (2010) Measurements of airborne Influenza Virus in aerosol particles from Human coughs. PLoS One 5:15100.
2. Fennelly KP, Jones-López EC, Ayakaka I, Kim S, Menyha H, et al. (2012) Variability of infectious aerosols produced during coughing by patients with pulmonary tuberculosis. Am J Respir Crit Care Med 186:450-457.
3. Fairchild C, Stampfer J (1987) Particle concentration in exhaled breath.VAm Ind Hyg Assoc J 48:948-949.
4. Papeneni R, Rosenthal F (1997) The Size Distribution of Droplets in the Exhaled Breath of Healthy Human Subjects. J Aerosol Med 10:105-116.
5. Moriarty JA, Grotberg JB (1999) Flow-induced instabilities of a mucus–serous bilayer. J Fluid Mech 397:1-22.
6. Andersen BM, Banrud H, Boe E, Bjordal O, Drangsholt F (2006) Comparison of UV C Light and Chemicals for Disinfection of Surfaces in Hospital Isolation Units. Infect Control Hosp Epidemiol. 27:729-34.
7. Fisher EM, Shaffer RE (2011) A method to determine the available UV-C dose for the decontamination of filtering facepiece respirators. J Appl Microbiol 110:287-295.
8. Heckert RA, Best M, Jordan LT, Dulac GC, Eddington DL, et al. (1997) Efficacy of vaporized hydrogen peroxide against exotic animal viruses. Appl Environ Microbiol 63:3916-3918.
9. Johnson JW, Arnold JF, Nail SL, Renzi E (1992) Vaporized hydrogen peroxide sterilization of freeze dryers. J Parenter Sci Technol 46:215-225.
10. Klapes NA, Vesley D (1990) Vapor-phase hydrogen peroxide as a surface decontaminant and sterilant. Appl Environ Microbiol 56:503-506.
11. Gato A, Martinez ML, Tudela C (2002) TGF-β3-induced chondroitin sulphate proteoglycan mediates palatal shelf adhesion. Dev Biol 250: 393-405.
12. Cuervo R, Valencia C, Chandraratna RA, Covarrubias L (2002) Programmed cell death is required for palate shelf fusion and is regulated by retinoic acid. Dev Biol 245: 145-156.
13. Croen LA, Shaw GM, Wasserman CR, et al. (1998) Racial and ethnic variations in the prevalence of orofacial clefts in California. Am J Med Genet 79: 42-47.
14. Leck I, Lancashire RJ (1995) Birth prevalence of malformations in members of different ethnic groups and in the offspring of matings between them in Birmingham, England. J Epidemiol Comm Health 49: 171-179.
15. Ching GH, Chung CS (1974) A genetic study of cleft lip and palate in Hawaii: I-interracial crosses. Am J Hum Genet 26:162-176.
16. Fujino H, Tanaka K, Sanui Y, et al. (1963) Genetic studies of cleft lips and cleft palate based on 2828 Japanese cases. Kyushu J Med Sci 14: 317-331.
17. Niswander JD, MacLean CJ, Chung CS, Dronamraju K (1972) Sex ratio and cleft lip with or without cleft palate. Lancet 2: 858-860.
18. Rittler M, Lopez-Camelo J, Castilla EE (2004) Sex ratio and associated risk factors for 50 congenital anomaly types: clues for causal heterogeneity. Birth Defects Res A Clin Mol Teratol 70: 13-19.
19. Calzolari E, Pierini A, Astolfi G, Bianchi F, Neville AJ, et al. (2007) Associated anomalies in multi-malformed infants with cleft lip and palate: an epidemiological study of nearly 6 million births in 23 EUROCAT registries. Am J Med Genet A 143: 528-537.
20. Tolarova MM Cervenka J (1998) Classification and birth prevalence of orofacial clefts. Am J Med Genet 75: 126-137.