

## Review Article

DOI: <http://dx.doi.org/10.18203/issn.2454-5929.ijohns20203222>

# ENT endoscopic procedures and aerosolization during COVID-19 pandemic: a review of concepts and guidelines

Mukul Patar<sup>1\*</sup>, Kusum Borsaikia<sup>2</sup>, Taufeequl Islam<sup>1</sup>

<sup>1</sup>Department of Otorhinolaryngology and Head and Neck Surgery, Gauhati Medical College and Hospital, Guwahati, Assam, India

<sup>2</sup>Department of Pathology, Jorhat Medical College and Hospital, Jorhat, Assam, India

**Received:** 19 May 2020

**Revised:** 06 July 2020

**Accepted:** 09 July 2020

**\*Correspondence:**

Dr. Mukul Patar,

E-mail: patarmukul@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

Otolaryngologists are more prone for exposure to aerosols during routine ENT examination and endoscopic procedures. ENT endoscopy procedures are considered as most aerosol-generating procedures and preferably routine procedures are avoided and deferred, if at all not necessary or urgent at this time of COVID-19 pandemic. The small particle size and extended travel of airborne aerosols mandate the use of specific personal protective equipment (PPE) and barriers by the health care workers to protect against transmission of COVID-19. Studies have recommended ENT endoscopy in awake patients with adequate topical preparation for local anaesthesia. Use of sprays should be avoided, instead, carefully placed pledgets should be used to provide adequate decongestion and anesthesia. Well ventilated endoscopy room with negative pressure (preferably), wearing a N95 mask with face shield or full PPE, thorough cleaning of entire endoscope after removal by standard disinfectants, decontamination of endoscopy room after each procedure and proper disposal of contaminated waste products are some common guidelines advised by health authorities globally till date.

**Keywords:** COVID-19, ENT endoscopy, Aerosol

## INTRODUCTION

Since its emergence in Wuhan, China in December 2019 the Corona virus disease (COVID-19) resulting from the novel coronavirus strain (SARS-CoV-2) is rapidly spreading throughout the world and represents an extraordinary health threat to the global population. Because of its rapid spread throughout the world and exponential growth curve, the World Health Organization (WHO) declared it as pandemic on 11 March, 2020.

Studies suggested that transmission of COVID-19 occurs by direct human to human transmission by projection of droplets, by hand contact or via inert surfaces. Virus is viable for up to several days depending on surface (plastic 72 hours and stainless steel for 48 hours) and conventional disinfectants ( $\geq 70\%$  alcohol), covering of

nose and mouth by mask, maintaining social distance of minimum 1 meter and frequent hand washing by soap are some of the effective measures to control the spread of the virus.<sup>1</sup> Incubation period of COVID-19 in children varies from 2-10 days and in adults the median duration of presence of viral RNA in upper respiratory secretions is 10.5 days (6-12 days).<sup>2,3</sup> At the time of writing this paper it is usual practice to quarantine subjects for 15 days.<sup>4</sup> Most importantly these information and advices for COVID-19 pandemic control from different authorities are subject to change depending on risk of transmission and ongoing situation in the locality.

ENT endoscopy performed by otolaryngologists are aerosol generating procedure (AGP) and chances of transmission of infection is high unless appropriate personal protective measures and guidelines are followed.

This article has been presented with the concept of review of different articles related to ENT endoscopy procedures in COVID-19 pandemic and finding some universally acceptable guidelines and protocols for implementation during endoscopic and routine aerosol generating procedures in otorhinolaryngology examinations and treatment. Different research articles related to my subject were searched through multiple approaches. Online search of abstracts and articles was conducted in Google Scholar, PubMed, Medline and Scopus by mentioning COVID-19 and aerosol, COVID-19 and endoscopy. All the related articles were reviewed and tried to attain a final conclusion regarding protective and preventive measures to be taken by otorhinolaryngologists against this aerosol generating transmission.

Objective of this study is to review and discuss the latest available concepts and guidelines for ENT Endoscopic procedures and risk of aerosolization during COVID-19 pandemic, and to accomplish an acceptable guideline for routine ENT endoscopy procedures.

## COVID-19 STATUS

With the rising trend of asymptomatic COVID-19 positive cases in the community it has become challenging for Otolaryngologists and all medical practitioners to approach their patients for diagnostic and treatments procedures. Routine testing for determination of COVID-19 status is not available till filing of this paper, but in coming days because of possible risk of COVID-19 becoming endemic preprocedural testing may become a compulsory routine test before any diagnostic and treatment procedures. Until the supply of testing materials catches up with accelerating demand for testing, COVID-19 status of all patients will be unknown. Therefore, when detailed examination or surgical procedure is necessary for urgent or emergent care and COVID-19 status cannot be confirmed, then every patient should be handled as if COVID-19 positive. This should apply regardless of whether in an OPD, hospital or operating room setting.<sup>5</sup>

## ENDOSCOPY IN ENT

Endoscopic examinations of the nose, sinuses, oropharynx, hypopharynx and larynx are among the most common head and neck diagnostic procedures and are routinely performed by ENT practitioners and trainees. They are considered aerosol-generating procedures.<sup>6</sup> So, a deeper understanding of the aerosolization risks is needed to guide both near and long-term protection strategies against transmission among health workers.

Coronaviruses are approximately 0.125 microns in size and are frequently carried in respiratory droplets.<sup>6,7</sup> Booth et al conducted one study on SARS in 2005 and SARS-CoV has been measured in air samples within 1 m of an infected patient in 11 samples over 8 hours suggesting a

high risk for airborne transmission.<sup>8</sup> A recent study conducted by van Doremalen et al supports this data by demonstrating that aerosolized particles of SARS-CoV-2 less than 5  $\mu\text{m}$  remain viable in air for at least three hours.<sup>9</sup>

Aerosolized particle sizes generated during sneezing or coughing have been documented as ranging from  $<1$  to  $<500 \mu\text{m}$  with greater than 99% of particles larger than 8  $\mu\text{m}.$ <sup>10,11</sup> The small particle size and extended travel of airborne aerosols mandate the use of specific PPE to protect against inhaled transmission. N95 respirators are air purifying respirators which protect against droplet or airborne transmission. They fulfill the filtering efficiency criteria set forth by the National Institute for Occupational Safety and Health (NIOSH) and filter with 95% efficiency of large droplets and penetrating aerosols up to 0.3  $\mu\text{m}$  in diameter.<sup>7</sup>

News report from Wuhan have suggested that otolaryngologists have been infected at higher rates than other physicians within the same hospital systems.<sup>12</sup> It has been observed that the nose and nasopharynx shown to be reservoirs for high concentrations of the SARS-CoV-2 virus and after manipulation of these organs, viral particles have been shown to be air borne for 3 hours or more.<sup>9,13</sup> Studies suggest that simulated sneezing event can generate aerosols which settle maximally between 30 cm from the nasal opening but can extend up to 66 cm and nasal endoscopy alone may be considered as one of most potential irritative aerosol generating procedure in ENT OPD, capable of producing aerosols as a result of sneezing or coughing.<sup>7,14</sup> Spread of these aerosols were effectively prevented by both the intact and modified VENT masks (which enable endoscopy) conditions suggesting that outpatient endoscopy could be more safely performed while using a barrier technique.<sup>7,14</sup>

Transmission of infection among healthcare workers (HCWs) has raised concerns regarding proper and rational use for personal protective equipment (PPE) in constrained environment. Precautions have to be adopted for endoscopic examinations of the head and neck as for other aerosol-generating procedures. On the contrary, Workman et al mentioned diagnostic nasal endoscopy is not intrinsically aerosol generating. However, the unpredictable triggering of irritative sneezing suggests that practitioners should continue to wear PPE for undiagnosed suspected patients despite the potential benefits of barrier methods.<sup>7</sup>

## PRESENT CONCEPTS AND GUIDELINES

With every coming day modification of different concepts and guidelines are expected. It is expected that each health authority or organization is making specific decisions appropriate to their community.<sup>15</sup> Endoscopy should be limited to patients who have a clear indication and should be performed by the most experienced personnel available in an expedient fashion.<sup>15</sup> Low-

priority examinations should be deferred. Endoscopy room should be well ventilated, with negative pressure, if available, and the use of PPE should follow the guideline issued by health authority.

Givi et al has suggested some recommendations on endoscopy, include the following in awake patients, adequate topical preparation to make the examination more comfortable is important. However, use of sprays should be avoided. Carefully placed pledgets should be used to provide decongestion and anesthesia. Topical anesthesia for any office-based intervention of the larynx under the guidance of a laryngoscope or strobolaryngoscope is performed through application of a spray.<sup>15</sup> This is considered high risk; therefore, office-based biopsy, injection, laser, or other procedures should be delayed if possible. If a video screen is available to project the examination, it should be used to keep the patient's and health care worker's faces apart. Disposable endoscopes may be considered. After completion of the examination, the endoscope must be appropriately handled and should not be removed from the examination room without a protective cover.<sup>15</sup>

According to a study conducted by Cui et al in China, the otolaryngology health care workers in the epidemic center (Wuhan) and other areas (Shenzhen, Shanghai) took third-level protection and second-level protection, respectively when treating patients for common otolaryngologic diagnoses or symptoms such as rhinitis, nasal congestion, hyposmia, sore throat, dizziness, tinnitus, and otitis externa.<sup>17</sup> The second-level protective measures include wearing medical protective masks equivalent to N95 respirators, eye protection such as goggles or face shields, work clothes, disposable isolation gowns and/or coveralls, shoe covers, gloves, and hair covers. The third-level protection measures added a powered air-supply filter respirator (PAPR) such as a positive pressure headgear or a comprehensive respiratory protective device according to expert consensus in China.<sup>16,17</sup> It was observed that Otolaryngologists performing a tracheotomy or procedures for control of hemorrhage in circumstances of tracheal/oral bleeding or epistaxis in patients infected with SARS-CoV-2 utilized third-level infection control measures.<sup>17</sup>

As endonasal procedures carry a risk of infectious aerosolization of viral particles such as SARS-CoV-2, a dedicated space should be reserved to perform procedure, with little material as possible to facilitate cleaning between each exercise.<sup>4</sup> Endoscopy should not be performed in partial airway obstruction diagnosis, if clinically well tolerated.<sup>4</sup> If at all necessary, The French Association of Paediatric Otorhinolaryngology (AFOP) and French Society of Otorhinolaryngology (SFORL) issued some guidelines for ENT endoscopy.<sup>4</sup>

Otolaryngologist should wear full PPE: FFP2 mask, overcoat, cap, protective gloves. All of the equipment is

then thrown into dedicated infected waste bins in the examination room except protective glasses that can be decontaminated and reused.

Nasal endoscope placed on a clear separate table, if used, camera should have a protective cover.

After removal, thorough cleaning of entire endoscope, including proximal area that have not been in direct contact with skin/mucosa should be performed after completion of procedure.

Decontamination of endoscopy room through cleaning of all surface area of examination room. A delay of at least 30 min should be given before reusing the room for another patient. Local anaesthesia with lignocaine spray usually not recommended, induce sneezing.<sup>4</sup>

In India and abroad COVID-19 situation is evolving fast and guidelines are subject to change over time, but we should follow the recommendations about execution, sterilization and personal protection for endoscopy procedures during COVID-19 pandemic for all healthcare workers in otolaryngology units. Module for health care workers (may be modified as per progression of the disease) prepared by Health Authority, Assam, India (dated 07-05-20) based on guidelines of MoHFW (Ministry of Health and Family Welfare), Govt. of India, WHO, ICMR (Indian Council of Medical Research) and NCDC (National Centre for Disease Control), scheduled endoscopic procedures as follows.<sup>18</sup>

**Emergency endoscopic procedures:** Life-threatening conditions, for example, removal of impacted foreign body.

**Urgent endoscopic procedures:** Diseases/conditions in which the treating clinician feels that an endoscopic procedure will have a significant beneficial impact on clinical outcome over the next 1 month.

**Routine endoscopic procedures:** Procedures that do not fall in either of the aforementioned two categories, for example, all routine referrals for diagnostic endoscopy procedures, and for screening or surveillance.

Only emergency and urgent endoscopy procedures may be undertaken for the next 4 weeks or until the current threat of COVID-19 lasts or further evidence becomes available. Routine endoscopy procedures can usually be safely postponed for 1 month. In such cases, alternative approaches (e.g. radiological) for diagnosis or treatment may also be explored.

#### **Pre-procedure screening**

##### **Low risk**

No symptom suggestive of COVID-19 (cough, fever, breathlessness, or diarrhea). No history of travel to or

stay in a high-risk area in the past 14 days. No contact with a COVID-19 patient.

#### Intermediate risk

Symptoms present but no history of travel to or stay in a high-risk area during the past 14 days or of contact with a COVID-19 patient; or no symptom, but history of contact with a confirmed COVID-19 patient or stay in or travel to a high-risk area in the last 14 days.

#### High risk

At least one symptom present; and either contact with a confirmed COVID-19 patient or of stay in a high-risk area.

#### In the procedure room

The number of staff members present in the endoscopy area during the procedure should be reduced to the minimum. All members of the endoscopy team should wear appropriate personal protective equipment (PPE), such as gloves, mask, eye shield/goggles, face shields, and gown, as appropriate, based on risk assessment and stratification and undertake adequate handwashing before and after handling the patients. For high-risk cases, ensure that appropriate PPE is available and worn by all members of the endoscopy team. No additional steps beyond those currently recommended for endoscope cleaning and reprocessing are needed. As far as possible, only disposable endoscopic accessories should be used. Standard endoscopy room disinfection policy should be followed for non-COVID-19 or low-risk patients undergoing endoscopy.

For patients with intermediate or high risk of COVID-19 infection, noncritical environmental surfaces frequently touched by hand and endoscopy furniture and floor should be disinfected at the end of each procedure. With a COVID-19 positive or very high-risk case with respiratory symptoms, the endoscopy may be performed in a negative-pressure room, if available.<sup>18</sup> In present situation of COVID-19 pandemic, all national and international societies are encouraged to follow standardized sterilization procedures for endoscopes.<sup>19</sup> Instrument sterilization should always be performed immediately after finishing the procedure; moreover, the disinfection and reprocessing of the endoscope and instruments used for a patient with COVID- 19 are similar to those used in standard practice.<sup>20</sup> de luca et al conducted a review of the recent literatures on endoscopic otolaryngology procedures during COVID-19 pandemic and evaluated maximum available data published until April 15, 2020.<sup>21</sup> They identified sixty-six societies and found 40.9% of them published information and recommendations regarding nasal, pharyngeal and laryngeal endoscopy procedures during COVID-19 pandemic. It was seen that the majority of societies (88.9%) suggested to perform endoscopy procedures only

if strictly necessary; one (3.7%) recommended to avoid flexible endoscopy in all cases. Simultaneously, the ENT UK at The Royal College of Surgeons of England have suggested to consider whether to use or avoid topical decongestant and local anaesthetic solution to reduce chances of sneezing and coughing during examination.<sup>22</sup>

#### CONCLUSION

At the moment of writing this paper it has been observed that outbreak of COVID-19 is going fast in parts of India and some countries abroad with a daily rising curve of new cases. Rising trend of asymptomatic COVID-19 positive cases in community has made the scenario more challenging for Otolaryngologists to perform their routine examination and diagnostic procedures. During this pandemic, the information and advices regarding different diagnostic and treatment procedures from different authorities is subject to change depending on ongoing local situation and developments of COVID-19 pandemic and we should strictly follow the national and local guidelines issued by concerned authorities and keep us updated on latest advices available.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

#### REFERENCES

1. Ong SWX, Tan YK, Chia PY, Lee TH, Ng OT, Wong MSY, et al. Air, surface, environmental and personal protective equipment contamination by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) from asymptomatic patient. *JAMA* 2020.
2. Cai J, Xu J, Lin D, Yang Z, Xu L, Qu Z, et al. A case series of children with 2019 novel Coronavirus infection: clinical and epidemiological features. *Clin Infect Dis*. 2020.
3. Chang D, Mo G, Yuan X, Tao Y, Peng X, Wang F, et al. Time kinetics of viral clearance and resolution of symptoms in novel Coronavirus infection. *Am J Respir Crit Care Med*. 2020.
4. Sagardoyb LT, Akkaric M, Ayari-Khalfallahd S, Celeriera C, Fayoux P, Luscan R, Mansbach AL, et al. COVID-19 and ENT Pediatric otolaryngology during the COVID-19 pandemic. Guidelines of the French Association of Pediatric Otorhinolaryngology (AFOP) and French Society of Otorhinolaryngology (SFORL). *Eur Ann Otorhinolaryngol Head Neck Dis*. 2020;137(3):177-181.
5. Otolaryngologists and the COVID - 19 pandemic; American Academy of Otolaryngology - Head and Neck Surgery; 1650 Diagonal Rd, Alexandria, VA 22314; Available at: <https://www.entnet.org>. Accessed on 23 March 2020.
6. Fehr AR, Perlman S. Coronaviruses: An overview of their replication and pathogenesis. In: *Coronaviruses: Methods and Protocols*. 2015. US

Centers for Disease Control and Prevention. Available at: <https://www.cdc.gov/coronavirus/2019-nCoV/infection-control/control-recommendations.html>. Accessed on 23 March 2020.

- 7. Workman AD, Welling DB, Carter BS, Curry WT, Holbrook EH, Gray ST, et al. Endonasal Instrumentation and Aerosolization Risk in the Era of COVID-19: Simulation, Literature Review, and Proposed Mitigation Strategies. *Int Forum Allergy Rhinol.* 2020;10(7):798-805.
- 8. Booth TF, Kournikakis B, Bastien N, Ho J, Kobasa D, Stadnyk L, et al. Detection of airborne severe acute respiratory syndrome (SARS) coronavirus and environmental contamination in SARS outbreak units. *J Infect Dis* 2005;191:1472-7.
- 9. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *N Engl J Med.* 2020;382(16):1564-7.
- 10. Seto WH. Airborne transmission and precautions: facts and myths. *J Hosp Infect* 2015;89:225-8.
- 11. Thompson KA, Pappachan JV, Bennett AM, Mittal H, Macken S, Dove BK, et al. Influenza aerosols in UK hospitals during the H1N1 (2009) pandemic--the risk of aerosol generation during medical procedures. *PLoS One.* 2013;8:e56278.
- 12. Europe's Doctors Repeat Errors Made in Wuhan, China Medics Say. *Bloom News.* 2020.
- 13. Zou L, Ruan F, Huang M, Liang L, Huang H, Hong Z, et al. SARS-CoV-2 viral load in upper respiratory specimens of infected patients. *N Engl J Med.* 2020;382(12):1177-9.
- 14. Merrett D, Knox E, Thach L, Beckett T, Burk B, Light A. FIO<sub>2</sub> Capability of a Procedural Oxygen Mask During Different Breathing Patterns and Oxygen Flows. *Respir Care.* 2019;64:3239-438.
- 15. Givi B, Schiff BA, Chinn SB, Clayburgh D, Iyer NG, Jalisi S, et al. Safety Recommendations for Evaluation and Surgery of the Head and Neck During the COVID-19 Pandemic. *JAMA Otolaryngology-Head Neck Surg.* 2020.
- 16. Chun-hui L, Xun H, Meng C. Expert consensus on personal protection in different regional posts of medical institutions during novel coronavirus pneumonia(COVID-19) epidemic period. *Chinese J Infection Control.* 2020;19(3):1-15
- 17. Cui C, Yao Q, Zhang D, Zhao Y, Zhang K, Nisenbaum E, Cao P, et al. Approaching Otolaryngology Patients during the COVID-19 Pandemic. *Otolaryngol Head Neck Surg.* 2020;0194599820926144.
- 18. Training module on COVID-19 for the State of Assam, published on 07-05-2020 as per direction of Ministry of Health and Family Welfare, Govt of Assam, India. Available at: <https://covid19.assam.gov.in>. Accessed on 2 March 2020.
- 19. Kramer A, Kohnen W, Israel S, Ryll S, Hubner NO Luckhaupt H, et al. Principles of infection prevention and reprocessing in ENT endoscopy. *GMS Curr Top Otorhinolaryngol Head Neck Surg.* 2015.
- 20. Chiu PWY, Ng SC, Inoue H, Reddy DN, Ling Hu E. Practice of endoscopy during COVID-19 pandemic: position statements of the Asian Pacific Society for Digestive Endoscopy (APSDECOVID statements). *Gut.* 2020.
- 21. Luca PD, Scarpa A, Ralli M, Vincentiis MD, Cassandro E, Chiarella G, et al. Nasal, pharyngeal and laryngeal endoscopy procedures during COVID-19 pandemic: available recommendations from national and international societies. *European Archives of Oto-Rhino-Laryngology.* 2020.
- 22. ENTUK-The Royal College of Surgeons of England Nasal endoscopy and laryngoscopy examination of ENT patients. 2020. Available at: [https://www.entuk.org/sites/default/files/Nasal%20endoscopy%20and%20laryngoscopy%20examination%20of%20ENT%20patients\\_compressed%20%281%29.pdf](https://www.entuk.org/sites/default/files/Nasal%20endoscopy%20and%20laryngoscopy%20examination%20of%20ENT%20patients_compressed%20%281%29.pdf). Accessed on 2 March 2020.

**Cite this article as:** Patar M, Borsaikia K, Islam T. ENT endoscopic procedures and aerosolization during COVID-19 pandemic: a review of concepts and guidelines. *Int J Otorhinolaryngol Head Neck Surg* 2020;6:1579-83.